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American Machinist

JULY 1, 1936

CARBIDES GROUND

in Half the Time

No stunts—just two new wrinkles—are used in this improved technique which takes each step in its proper sequence

N. N. SHEPHERD
Carboloy Company, Inc.

BY USING the proper technique, wheels and equipment, the time now required to grind carbide tools is drastically reduced as compared to that formerly required. With the latest technique, the ordinary dull tool, Fig. 1, was completely reconditioned in 2 min. 36 sec. Its size is $\frac{5}{8}$x1$\frac{1}{4}$ in. Five minutes would be considered excellent time using previous methods on silicon-carbide wheels and under the most ideal conditions. The "milled and brazed" carbide tool, Fig. 2 (size $\frac{3}{4}$x$\frac{3}{4}$ in.) required only 4 min. 36 sec. to rough, semi-finish and finish grind (sharpen) on the top face, and side and front clearances. At least 10 min. formerly would be required. The broken tool, Fig. 3 (size $\frac{1}{2}$x$\frac{3}{4}$ in.), chipped to a depth of about $\frac{1}{8}$ in., was completely reconditioned in 3 min. A time of 15 min. and over would not be unusual ordinarily.

The times given above for grinding typical tools under the old practice are extremely conservative. In one instance, a large mid-western manufacturer stated that his men required 2 hr. on an average to grind $\frac{5}{8}$x1$\frac{1}{4}$-in. milled and brazed carbide tools. In a demonstration given for this manufacturer, a milled and brazed tool of this size was ground in 7 min. The large amount of grinding time consumed in his shop is exceptional, but it is not unusual to find instances of 15 to 20 min. being required to grind a milled and brazed tool of the same size.

Many feel that, to obtain such drastic reductions in time for grinding carbide tools, a new technique and costly machine changes are required. Such is not the case. With two exceptions, the various operations have been recognized and practiced for years. However, it is safe to say that no *one* plant has employed *all* of these individual operations in one standardized procedure. In other words, practically all plants grinding carbide tools are using one or more of these operations but none are employing them all.

The requirements necessary to grind carbide tools rapidly and without injury to the carbide tip may be divided into three factors:

1. **The grinding technique**
2. **The grinding wheels**
3. **The grinding machine**

With regard to the first there are four important factors which have made possible this rapid grinding. After explaining these, the complete rough, semi-finish, and finish (sharpening) grinding procedure will be described in detail. The four important factors are as follows:

Fig. 1—This ordinary dull tool, size $\frac{5}{8}$x1$\frac{1}{4}$ in., was completely resharpened in 2 min. 36 sec.

Fig. 2 — This "milled and brazed" carbide tool was ground on all surfaces in 4 min. 36 sec.

Fig. 3—Chipped to a depth of $\frac{1}{8}$ in. this tool, size $\frac{1}{4}$x$\frac{3}{4}$ in., was reconditioned in 3 min.

1. How to Dress Wheels for Rapid Stock Removal

For the rough and semi-finish grinding operations the wheel is dressed with

a slight crown as illustrated in Figs. 4 and 5. On straight wheels used for rough grinding, the *periphery* of the wheel is dressed with a crown of 1/8 in. On cup wheels for roughing, the *face* of the wheel is dressed with a crown of about 1/8 in. and on cup wheels for *semi-finishing*, the face of the wheel is similarly dressed. With proper tool manipulation, little re-shaping of this crown is required. All rough and semi-finish dressings are done with a mechanical dresser. For finish grinding, or sharpening, the cup wheel is dressed flat with a diamond-impregnated carbide dresser.

The importance of dressing the wheels for roughing and semi-finishing with a slight crown cannot be overemphasized. It greatly reduces the area of contact of the tool against the wheel, and thus helps to keep at a minimum the amount of localized heat generated in the carbide tip.

II. Double, or Composite, Clearance Angles

For rapid grinding, and also to obtain the best possible finish, the carbide tool should be ground with double, or composite, clearance angles. This is done by rough grinding at from 2 to 5 deg. greater than the finished angle desired (2 deg. greater on heavy-duty tools and 5 deg. greater on light-duty tools); then finish grinding, on the carbide tip *only*, the final clearance angle required. For purposes of illustration assume a finish-ground angle of 6 deg. and that rough grinding will be done at an angle of 4 deg. greater than this. The composite angles then would be as shown in Fig. 8. By following this procedure most of the steel shank is ground back while roughing, and very little, if any, of the steel shank touches the wheel while finish grinding. Because of this the wheel remains more open and free cutting, producing a better cutting edge.

III. Alternate Grinding on the Carboloy Tip and Steel Shank

Alternate grinding on the carboloy tip and the steel shank represents a simple method of hogging off large amounts of stock rapidly, without injury to the carbide tip. This method is usually employed in the case of badly chipped tools as illustrated in Fig. 3 or when changing the shape of a tool. By employing this procedure it is unnecessary to dress the wheel except to reshape the crown when worn.

Ordinarily, redressing is required at frequent intervals when grinding steel on silicon-carbide wheels. Steel loads the wheel rapidly as silicon-carbide wheels are intended specifically for grinding cemented carbide. Conversely, carbide tends to dress silicon-carbide wheels. Therefore, by alternating on the carbide tip and the steel shank, the wheel is kept open and free cutting, permitting rapid, continuous stock removal. The procedure is illustrated in Fig. 9. The table rest is first set at an angle 15 deg. below horizontal. Holding the tool across the knife edge of the table rest, it is then presented to the wheel at an acute angle and a small amount of the steel shank hogged off. When the wheel starts to load slightly, the grinding is shifted from the steel shank to the carbide tip. Alternate grinding is continued in this manner until sufficient stock has been removed to prepare the tool for the next grinding operation. Keep the tool rocking and twisting.

Whenever possible, the steel shank may of course be ground on an ordinary wheel used for grinding high-speed steel and the balance of the grinding then transferred to the silicon-carbide wheel for grinding the carbide tip.

IV. Continuous Motion of Tool Required

In order to prevent excessive generation of localized heat in the carbide tip it is vitally important that the tool be kept in constant motion while grinding. There are two ways in which the tool should be kept in motion. The first, and most important, is to keep the tool slowly but continuously moving back and forth across the entire surface of the wheel, as illustrated in Fig. 10. This movement should be maintained at all times, whether roughing, semi-finishing, or finishing. The second movement is less essential but is nevertheless important in obtaining rapid stock removal. This consists of rocking the tool, as illustrated in Fig. 11. It is recommended for use only while roughing and semi-finishing, not while finish grinding.

Rough Grinding on Straight Wheels

Grinding on the periphery of straight, silicon-carbide wheels is recommended for the roughing operation. The cutting action is more rapid (and is further accelerated by the dressing of a 1/8-in. crown on the wheel). It also keeps the area of contact at a minimum. However, straight wheels should not be used after they have worn under 6 in. in diameter. Smaller wheels produce excessively concave surfaces. Where facilities are not available for rough grinding on the periphery of a straight wheel, satisfactory results, although somewhat slower, can be obtained by using the face of a rough cup wheel, prepared with a crowned surface 1/8 in. high. When using cup wheels for roughing, the top face and side clearance angle are ground by applying the tool across the outer corner of the wheel. This reduces the area of contact between the work and the wheel and allows the tool to be hollow ground the same as on the periphery of a straight wheel. The front clearance angle is ground on the surface of the wheel nearest the counterbore.

Detailed Grinding Procedure

Following the four procedures as described above, the complete grinding of a right-hand, straight-shank, carbide turning tool will be given below. To show the complete procedure, assume that the tool is excessively dull and flaked on the top face, requiring rough, semi-finish and finish grinding [sharpening] on the top face and side and front clearances. Naturally, the number of steps required to resharpen a tool depends upon its condition.

Exert moderate, *not heavy*, pressure while roughing, and light pressure while semi-finishing and sharpening. Regarding proper angles to use: In the following description assume that the finished ground angle desired is 6 deg. and that the angle for rough grinding is 10 deg., or 4 deg. greater than the finished angle. The range for this greater roughing angle is about 2 deg. for heavy-duty tools and 4 to 5 deg. for light-duty tools.

Operation No. 1 Rough Top Face

Rough hollow grind top face of tool on periphery of straight wheel (with crowned surface). Hold tool in hands (not against table). Leave about 1/32 in. land at the cutting edge of the tool. Use 60-grit, soft, silicon-carbide wheel. This free-hand grinding is done only when one or two tools are to be ground. When a quantity of tools with the same top side rake are to be ground, set the table at the proper angle to save time and maintain the correct top rake.

Operation No. 2 Rough Front Clearance

Set table rest at 10 deg. (4 deg. greater than finished angle desired), and rough grind front clearance, leaving about 1/32 in. land at cutting edge. Hold tool against table rest. Use same wheel as in Operation No. 1. Angle at which table rest is set will vary with the diameter of the wheel. However, 10 deg. should be angle on tool.

Operation No. 3
Rough Side Clearance

Rough grind side clearance. Use same wheel and same angle of table rest as in Operation No. 2.

Operation No. 4
Semi-Finish Top Face

Using face of cup wheel (prepared with 3/32 to 1/8 in. crowned surface), and with table rest set at finished angle desired, semi-finish grind top face of tool. Use 100- or 120-grit, soft silicon-carbide wheel.

Operation No. 5
Semi-Finish Side Clearance

Set table rest at 6 deg. (finished angle desired). Reverse wheel direction and on left-hand face of wheel, semi-finish grind side clearance. Note that wheel rotation is always *from* carbide tip *to* steel shank. Use same wheel as Operation No. 4.

Operation No. 6
Semi-Finish Front Clearance

Semi-finish grind front clearance, also radius on nose of tool. Use same wheel as in Operation No. 5.

Operation No. 7
Sharpen Top Face

Set table rest for correct top side ake. On same wheel as Operation No. 6, dress a flat surface on the face, using diamond-impregnated carbide dresser, and use wheel dressed in this way for the following operations which are required to sharpen the tool (8, 9, 10). Reverse direction of wheel and on right-hand face of wheel, sharpen top face of tool.

Operation No. 8
Sharpen Side Clearance

Set table rest at 6 deg. (Finished angle.) Reverse wheel and on left-hand face of wheel finish-grind side clearance. Use wheel dressed the same as in Operation No. 7. Examine for finish by holding the tool so that light reflects across the surface of the tip.

Operation No. 9
Sharpen Front Clearance

Finish grind front clearance, using wheel dressed the same as in Operation No. 8, and table rest at same angle.

Operation No. 10
Sharpen Radius

Finish grind radius on nose of tool. Use same wheel as in Operation No. 9, and table rest at same angle.

When it is necessary to grind the top face, this is always done before grinding on the side or front clearances.

The 4 Basic Requirements of Rapid Carbide Tool Grinding

1 Proper Dressing of Wheels

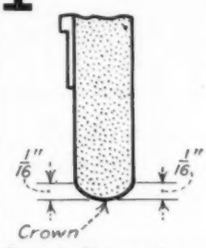


Fig.4. Shape for roughing on periphery of straight wheels

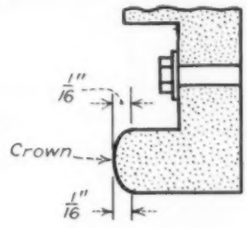


Fig.5 Shape for semi-finishing on face of cup wheels

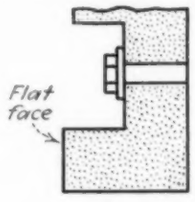


Fig.6. Shape for sharpening on face of cup wheel

2 Use of Composite Angles

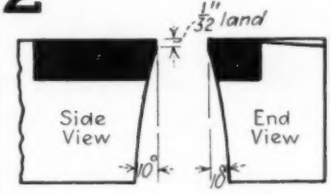


Fig.7
Rough grind at an angle 4 deg. greater than finished angle desired

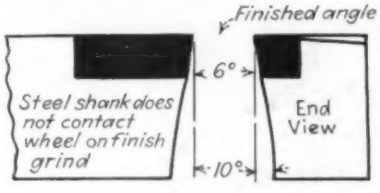
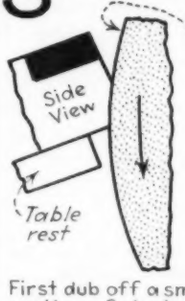


Fig.8
Finish grind on carbide tip only at final angle desired

3 Alternate Grinding on Carbide Tip and Steel Shank



First dub off a small section of steel shank

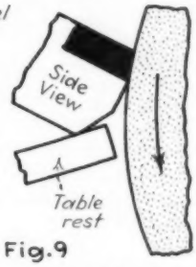


Fig.9

Then dub off a small section of carbide tip

Keep alternating until desired amount is dubbed off

4 Maintaining Constant Tool Motion

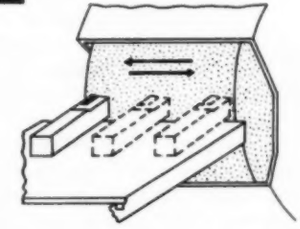
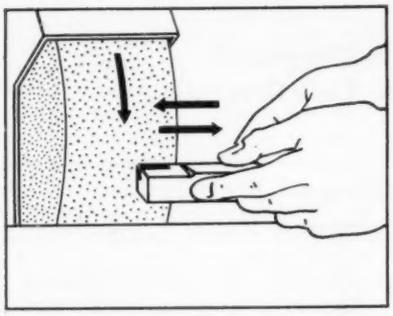
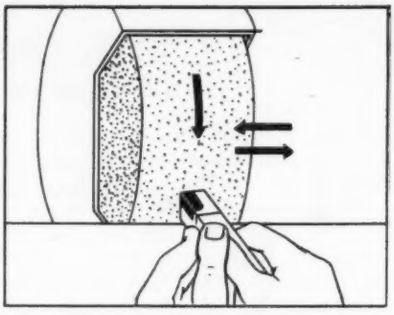


Fig.10 Always keep tool moving across surface of wheel

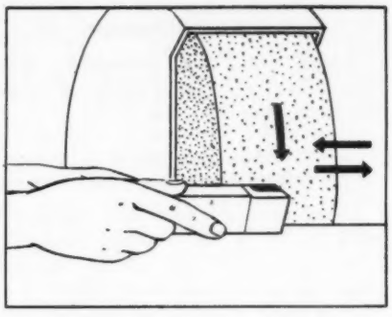
Fig.11
Keep tool rocking during rough and semi-finish grinding



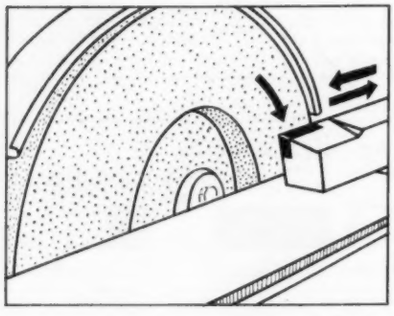
Operation No.1
Rough Top Face



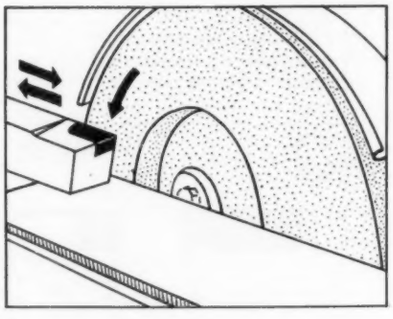
Operation No.2
Rough Front Clearance



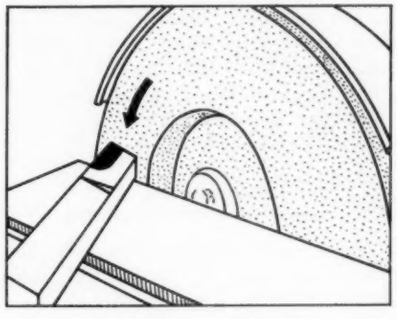
Operation No.3
Rough Side Clearance



Operations No.4 & 7
Semi-Finish Top Face (4)
Sharpen Top Face (7)



Operations No.5 & 8
Semi-Finish Side Clearance (5)
Sharpen Side Clearance (8)



Operations No.6 & 9
Semi-Finish Front Clearance (6)
Sharpen Front Clearance (9)

This is particularly important when finish grinding, if the best possible cutting edge is desired. When grinding on the top face, the movement across the face of the cup wheel is limited to a small area. Because of this, a slight recess is formed in the wheel as the tool is being ground. The corner of this recess rubs the front and nose of the tool and tends to dull those surfaces. By grinding the front and side clearance *last*, this difficulty is avoided.

This completes the procedure for the rapid grinding of carbides.

Consideration must be given to the grinding machine requirements. Foremost among these is rigidity. Motors should be mounted so that the torque vibration will not be transmitted to the machine. The spindle itself should be free from end play as a loose spindle causes a difference in cutting action of the wheel due to the pounding action. This may cause checks in the carbide.

Other grinding machine requirements are: amply large and easily adjusted table rests with graduated dial for determining correct angles; reversible motors so that the direction of wheel rotation is toward the carbide tip when grinding back surface of the tool; keyways in the table rests to guide protractor tool support and dresser; exhaust outlets to dispose of the excessive dust produced by the soft wheels required.

The use of correct grinding wheels is also an important factor. There are available today wheels which are entirely satisfactory for rapid grinding without injury to the carbide tip. The specifications follow:

Silicon Carbide Wheels for Grinding Carbides

(A) STRAIGHT WHEELS

(For *roughing only*. Wheels should not be used after wearing down to 6 in. diameter due to excessive concave surface ground on tools when wheels wear down to smaller diameters)

Carborundum	60R-WGG	(straight)
Norton	3760 I 7	(straight)

(B) CUP WHEELS

	Rough	Finish
Carborundum	60 R—WGG	120 S—WHG (or 100S)
Norton	3760 I 7	37120 H plus 7 (or 37100)

Under no circumstances should wheels other than special silicon-carbide wheels be used for grinding carbide, and these wheels should be of the soft grades recommended. Correct wheel speed is about 5,000 s.f.p.m.

Sharpening on Diamond Wheels And Lapping Disks

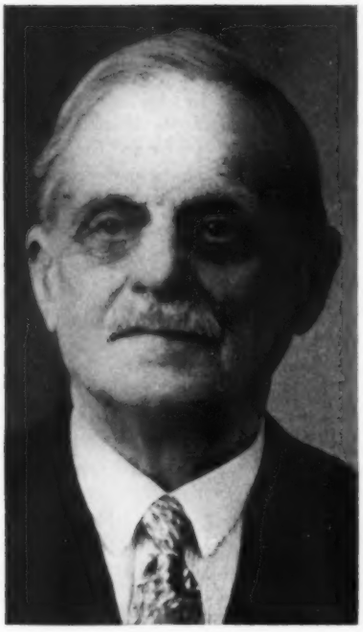
The procedure for finish grinding, or sharpening, carbide tools on diamond wheels or lapping disks is the same as operations No. 7, 8, 9, and 10. Use less pressure of the tool against the wheel and, when employing diamond wheels be careful to use the entire surface of the wheel, keeping the tool slowly in motion across the wheel. The tool, of course, should be previously ground to provide a larger clearance on the steel shank so that only the carbide tip contacts the diamond wheel. When the diamond wheels become loaded, apply pumice stone lightly against the revolving wheel. Frequently an ordinary paint brush saturated in kerosene will be sufficient to open up the wheel. For lubricating the wheel, use kerosene applied at the rate of about 40 drops per minute.

When using diamond-charged lapping disks follow the same sharpening procedure as described for diamond wheels. Occasionally add a small amount of No. 4 diamond dust immersed in olive oil to the surface of the tool in contact with the disk.

VI—It is a far cry from the old shop days when whiskers, gears and gas jets got together with calamitous results, and compressed air was joyfully wasted

◆

OLD HAZARDS and EARLY INVENTIONS



Elihu Thompson, dean of the electrical industry, and originator of "incandescent" welding

FRED H. COLVIN
Editor

NO MACHINIST who runs a modern lathe can appreciate the hazards and annoyances of the old open gears, narrow feed belts and open gas jets for night work. Years ago both the back gears and the screw cutting gear were entirely exposed, and it was not uncommon for loose sleeves or even flowing whiskers to get caught. Fortunately only few of the accidents were serious. Narrow feed belts, frequently only an inch wide, on small, slow running pulleys, gave very little power to pull the tool into the cut. Powdered resin was frequently resorted to in order to prevent slipping.

The open gas flame for night work or dark days was also a hazard, both as to fire and eyesight. Gas jets were jointed behind the lathe and could be swung through quite a wide range. They were particularly bad where relatively small holes were to be bored as the only way to see the tool at work was to swing the jet near the opening and look at the work through the gas, or transparent dark portion, of the burning flame. But the flame was always before the eyes, and whiskers were frequently singed.

Safety goggles were unknown in our shop and probably in others of that period. It was not uncommon to have brass or steel chips removed from the eye once a day at times. Bits of emery, for we used emery wheels then, were frequently coaxed into one corner by the use of an eye-stone, which was part of the shop equipment.

My old foreman, Charles Wescott, was an expert in removing things from the eye and he is still on the job, though not as an eye doctor. We all knew how to roll the eyelid over a matchstick and wipe out the offending particle with a piece of tightly rolled paper, or a loop of horsehair drawn across the eyeball.

One day when I was turning tool steel a small chip sunk itself in my eyeball. So Charlie backed me up into a corner, held my head so I couldn't move it, and dug it out with the blade of a pen knife.

ANOTHER disagreeable and dangerous practice was eliminated by exhaust systems in buffing and polishing rooms. I didn't often draw a job of polishing, but we were short handed one summer and I filled in for a few days. The combination of heavy perspiration and fine particles of brass soon gives one's arms a covering of "antique bronze" that may be beautiful on some living room decorations, but do not add to the questionable joy of a hot August day. This verdigris was anything but comfortable. It caused eruptions and infections of tender skins.

The now universal exhaust system is one of the great advances of the modern plant. *American Machinist* has been a staunch advocate of all forward looking steps of this kind.

One of the standing jokes of the old time shop, along with left-handed monkey wrenches and red signal oil, was the "putting-on" tool. Whenever a casting or forging was a bit shy in dimensions, or when we turned a piece too small, as sometimes happened, we sprung the putting-on tool wheeze, little dreaming we would ever have such a thing. Then came the welding torch, which I first saw in the plant of the Worcester Pressed Steel Co. My first introduction to welded jigs and fixtures, however, came in a most unexpected place, in a little bicycle shop in the outskirts of Birmingham, England, in the spring of 1914.

Butt welding, which we first knew as incandescent welding and later as resistance welding, dates back farther than many realize. Credit apparently belongs to Prof. Elihu Thompson, now the grand old man of the electric industry, who developed this, well before the beginning of the present century. I

well remember his small shop in Lynn, Mass., where he welded small bars of various metals together into souvenirs, of which I have one, given me by the Professor about 45 years ago. He, and his assistants, Charlie Harthan among them, built a machine for welding small chain, automatically, from a coil of wire. But it took many years to overcome prejudice against anything but forge-welded chain.

INVENTION and methods seem to go in cycles, or fashions. An example is the wabble plate type of motor or pump, where horizontal pistons in a sort of revolver chamber impinge on an angular disk and cause its rotation. The first motor of this kind I remember was built by Colt and exhibited by the Franklin Institute in Philadelphia in about 1887. It was steam driven. Then Horace A. Arnold designed one in the early days of the automobile, for kerosene propulsion. This was a variation in that he used cam faces on the driven disk instead of the wabble plate. John Hill put up the money for building the first (and last) motor, which never "moted" except for very short periods. This motor was built in the experimental shop of Francis Richards, a well known patent attorney of the day. John Guider, who long years afterward became works manager of the Pierce-Arrow plant in Buffalo, worked on the motor.

Next I recall the Torbert engine built in Rochester, which was exhibited at several of the automobile shows, both with a single and a double set of cylinders. I never saw it run or knew of its being used in any vehicle.

Some years later I ran across a similar engine in a shop in Seattle, but like the others, it was running at the time of my visit. The Army aviation corps became interested in this engine and I saw it again in the experimental laboratory in Dayton. Here I am told they tried very hard to get it to perform satisfactorily but finally dropped it as hopeless. It will probably turn up again in a few years a new idea. The method is being used in a pump I understand, with fair success. Now, I am told, there is one being tested at the Massachusetts Institute of Technology which gives much promise.

Hydraulic and friction drives have bobbed up in much the same way, but with far greater success. James Hartness put a hydraulic feed on one of his early flat turret lathes. Dan Wright, of Henry & Wright, told me years ago of a plan of his to drive all the machines in a shop from a central hydraulic pressure system, piped to each machine. The first hydraulic feed grinding machine I recall was on a small cylindrical machine in a small shop in Greenfield, perhaps 25 years ago.

An excellent example of how important a part opportunity plays in development is the case of the Warner cutmeter, which was put on the market about 40 years ago. Warner designed a meter with a rubber tired wheel to run on a piece of work in a lathe to show the surface speed. The work done by Taylor on cutting speeds had made us realize that we needed an instrument of this kind. Warner advertised this in the *American Machinist* and built up a demand of approximately 2,000 a year, according to rumors. This, however, was not enough for a profitable business and the future was none too bright. Then came the automobile and Warner saw his chance to use the same mechanism to record speed in miles per hour, and his business was assured.

A NOTICEABLE characteristic of the advocates of new methods or devices is the excesses to which they are carried. In the early days of the air brake the use of air pumps from locomotives for producing compressed air in the shop assumed the proportions of an epidemic. Compressed air was a new form of power that gave wide scope to inventive geniuses, who never stopped to count the cost of compressing the air. Air hoists were one of the early products of this age, and cylinders for opening and closing roundhouse doors and for operating the old "copy" book presses for letters, before the days of carbon paper. Air vises, air jacks and other applications were common. Banks of air pumps mounted on husky frames chugged away to supply compressed air for useful and useless purposes.

The traveling crane was another innovation that often was used expensively. I recall being in a large Pittsburgh shop soon after the installation of an overhead crane. The operator ran the crane to the other end of the shop, dropped his hook to the floor, and after some skillful maneuvering actually picked up a hand saw by the hole in the handle. Safely hooked, he proudly carried it to the other end of the shop and laid it down. It would be interesting to know just what that clever stunt cost in dollars and cents.

Magnetic lifting hooks, or lifting magnets were often similarly misused. Extremely useful when properly used, costly and dangerous in the hands of some. To some extent we have seen similar mistakes made in introducing new materials such as cemented carbide tools. All will agree, I think, that their useful application was delayed by over-enthusiastic claims.

There have been many changes in shop work and methods due to the material handling apparatus that is of more recent origin than many realize. Traveling cranes and conveyors are of comparatively recent origin. According to the best information I could obtain some years ago when studying some details of the 1876 Centennial in Philadelphia, no traveling cranes were either used in its construction or exhibited. And the main exposition hall was no small structure, being 1800 ft. long. I could never understand why it was not made 1776 ft. Jib cranes were used in some shops but traveling cranes were evidently of a later date.

During what may be called the compressed air era we saw long lines of air hose reaching the whole length of the shop and which hung in great festoons when the crane was at the "near," or air supply, end. The trolley was moved across the bridge by similar methods. Leakage was serious.

The electric motor has done wonders for us in the handling of material as well as in other lines. Its use on conveyors that can be stopped or started at will is more of a safety factor than many realize. The old method of stopping any machine or any section of a shop was to rush to the nearest clutch where power lines were divided, or to throw off a belt.

THE old Bullock Electric Company's shop in Norwood, outside Cincinnati, was the first shop I ever saw with every machine motor driven. This was about 1900. Every machine was painted with aluminum, another "first" so far as I am aware.

Those who remember the old Hill press room will recall the white enamel on the printing presses and other machines. John Hill got this idea from our mutual friend Dan Wightman, general manager of the old Pittsburgh Locomotive Works. Dan was formerly a young draftsman in the Rhode Island Locomotive Works following the Civil War, at the same time my father was a locomotive erector for them.

After Wightman became manager of the Pittsburgh works 40 years ago he did a drastic thing, especially for Pittsburgh. He painted all his machine tools white. It helped to make light in his shop but he had the usual trouble with oil stains on the white paint and the idea died a natural death. The white machines made it easy for shop photographers and the idea still persists in some kinds of factories, such as bakeries, canning plants and the like.

Talking Shop

Safety precautions are humane and contribute toward dividends as well. According to the National Safety Council, Emsco Derrick & Equipment Company reduced its insurance rate from 153 to 76 per cent of the annual rate in the course of seven years. One expense cut in half!

Value of Equipment

What can the foreman do to drive home to his men an appreciation of the value of company equipment? Here are just a few suggestions made by the American Rolling Mill Company: (1) Post permanent signs on each piece of equipment stating original cost and cost of important

and costly replacement parts; (2) Make sure every operator knows the cost per hour of the equipment he operates; (3) Train the men how to maintain and operate the equipment to the best advantage and with least abuse. The mere fact that a man has operated a machine for a long time does not mean that he is a good operator.

Which is better for a machine control, a push button or a lever? Either can be used to operate electric or hydraulic control or operating units. Each has its applications, of course, but it would seem reasonable to expect that the lever would be more popular so long as machinists and not typists are running our machines.

One-Man Shops

Anyone who gets the notion that small shops are things of the past should do a little investigating in old New England. While machine tools in that section are now made, for the most part, in shops that are far from small, there are still more one- and two-men shops than one might imagine.

One little shop, for example, makes tin boxes for a fairly well known maker of small tools. Another, father and son, makes wooden boxes for the same concern; and this tool making concern itself is not large by modern standards. If larger quantities were needed, they could probably be made for less money by larger suppliers. But in the numbers required the one-man shops fill the bill in every way.

Mechanically Minded

"During the past 30 years," says Henry G. Weaver, director of the Customer Research Staff, General Motors Corporation, "as a result of scientific research, inventive genius, experimentation and developments in production

technique, the self-propelled vehicle has been translated from an expensive novelty into an economic utility of widespread public acceptance. During the same period, and primarily as a result of the motor car itself, we have become a nation of mechanically minded people who have been around and seen things, a people who travel more in a year than our forefathers did in a lifetime."

One of our good friends estimates that social security will eventually cover 26,000,000 individuals, and that it will take one bureaucrat, big or little, to take care of about 150 people. A little arithmetic leads to the conclusion that more than 170,000 bureaucrats will be needed. A juicy morsel for a hungry politician who believes in the spoils system.

Starting Apprentices Right

Mark Twain once remarked concerning the weather that "many talked about it but few ever did anything." Almost the same might be said of apprenticeship. Many decry the lack of skilled men but few take the steps necessary to secure them.

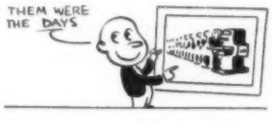
One of the concerns who have followed through with apprentice training is the Farrel-Birmingham Company. In a recent address, Vice-President Franklin R. Hoadley stated that they started grammar school boys at 40 cents an hour in the foundry and high school boys at 45 cents. It is foolish, they believe, to try and attract the right type of boys, boys who are to be future key men in the industry, by a rate lower than that paid to common labor.

On such a basis apprentice training can be made attractive and profitable.

Special Machine Tools

Large scale duplicate production in automobile and other lines of manufacture has had just the opposite effect on some at least, of the builders of machine tools. For while their business has increased, they can no longer build machines in as large lots as formerly, as many of the machines ordered are now special to some extent.

As a maker of a well known boring machine said that other day, "We used to build 25 or 50 machines at a time, all alike. We have photos of rows of them as they were assembled. We



couldn't get a photo of that kind now if we wanted it. We build more machines, but they are largely individual. And customers wonder why the prices are higher than they were twenty years ago."—*The Editors.*

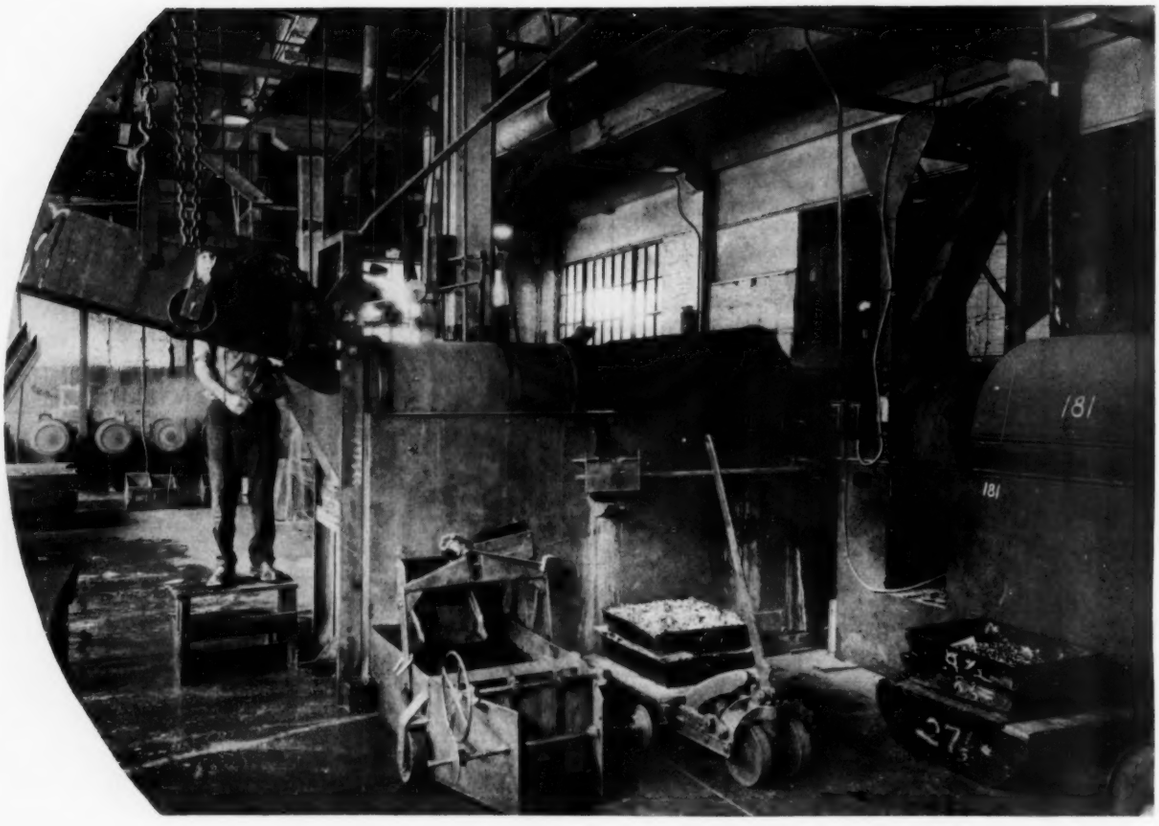


Fig. 1—Balls are discharged into a buggy at the side of the washing machine while the work is carried into the drier at the right

AFTER BURNISHING

A well planned layout is needed to keep down the cost of cleaning and separating workpieces from the burnishing balls

J. A. MURDOCK
Vaughn Novelty Mfg. Company

IN THE process of cleaning and drying small metal parts after burnishing, the cost of separating the balls from the work and of keeping them in good condition by proper washing is nearly as large an expense item as cleaning the work itself.

The bulk of the production at the Vaughn Novelty Mfg. Company consists of small stampings, such as beer bottle openers and can openers. Since these are sold in a highly competitive market, two things are essential. We must secure the finest finish at the lowest cost, and we must avail ourselves of every labor-saving device to obtain that low cost.

In our plant we burnish in ordinary tumbling barrels. Upon their discharge from these barrels, parts must be cleaned and separated from the burnishing balls. At the same time the balls must be cleaned and put back into the barrels for service on succeeding batches of work.

Work and balls are discharged from the burnishing barrels into sheet steel wheeled buggies of our own design. One is shown in the foreground in Fig. 1. It has a screen bottom so that almost all of the soap suds drain off while the buggy is being handled. Each loaded buggy is wheeled to the charging end of a washing machine. A chain hoist engages the steel bale on the buggy, lifts the load and discharges it through a rack-operated sliding door in the end.

In the washer, work and balls are thoroughly washed, rinsed and automatically separated. The balls return to a waiting buggy at the side of the

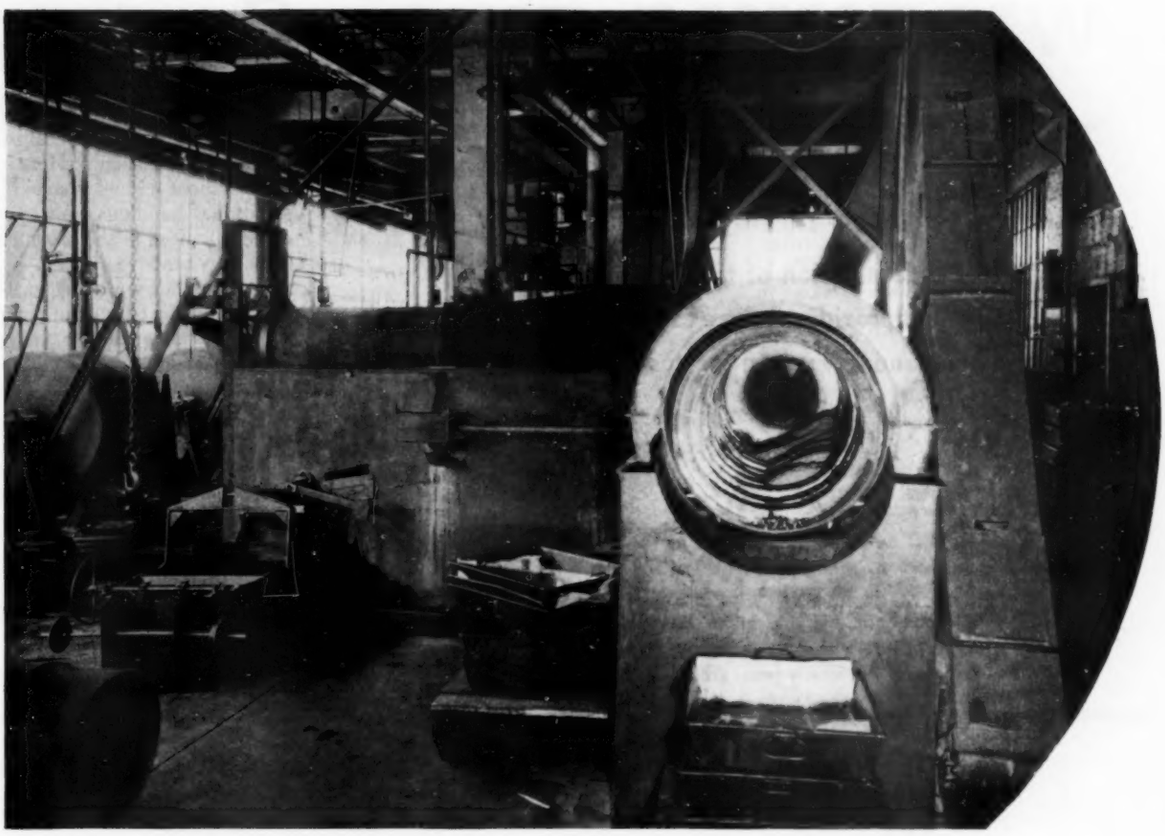


Fig. 2—Clean dry sawdust is fed into the drier at the charging end and is automatically screened out when it reaches the perforated section of the drum

washer. The work is discharged into a continuous sawdust driver (which in Fig. 1 bears the number 181). An end view of the driver is shown in Fig. 2.

This drier consists of a solid section and a perforated section. Work and sawdust pass through the drum together. The sawdust is screened out in the second section, passes over a heated drier for drying and returns to the charging end of the machine, so that there is a constant stream of hot dry sawdust going through the machine. The work is discharged into tote pans. Meantime, a new batch of plated work has been placed on top of the burnishing balls in the steel buggy, wheeled back to the burnishing barrels and discharged into them.

Our engineers installed this system with the assistance of N. Ransohoff, Inc. We consider this an ideal set-up for a plant already equipped with standard burnishing barrels, where the substitution of more modern barrels in which work and balls are automatically separated would prove too costly an undertaking.

Why as Well as How

C. R. DOOLEY

Manager of Industrial Relations
Socony-Vacuum Oil Company

APPRENTICESHIP is needed not only to develop skilled mechanics, who today are so scarce in some lines, but also because it forms a very important link in the whole educational program of the United States. A well worked out program of apprentice-training has many of the elements of a liberal education in it and is well adapted for any young man who upon leaving high school goes to work.

While the final result is the development of skill, the modern apprenticeship program contains instruction in English and scientific subjects related to the trade in hand. In other words, a great deal of the "why" goes along with the "how," or the "understanding" as well as the "doing."

I am not sure but what this training is quite as valuable in its broad background as preliminary to executive leadership, as it is for its specific development of trade skill. Many of the future foremen, superintendents and managers will come from this group of young men, and in such capacity they will, of course, find useful many of these related subjects, quite as much as with a technical understanding of their trade.

While the basic consideration of any apprenticeship program should always be that of the best interests of the young men who take it, nevertheless there is a very great and serious interest on the part of industry, because in many instances apprenticeship training is the basic means of developing skilled mechanics. Further there are many instances where the continuous regular employment of thousands of unskilled and semi-skilled men depend greatly upon the work of a few highly skilled workmen. Therefore, in a very real sense, the training of a skilled mechanic provides employment for large numbers of people.

WIDENING TWO BOTTLE NECKS

II—Modernization of the heat-treating department provides reserve capacity for emergencies and will return the cost within a year

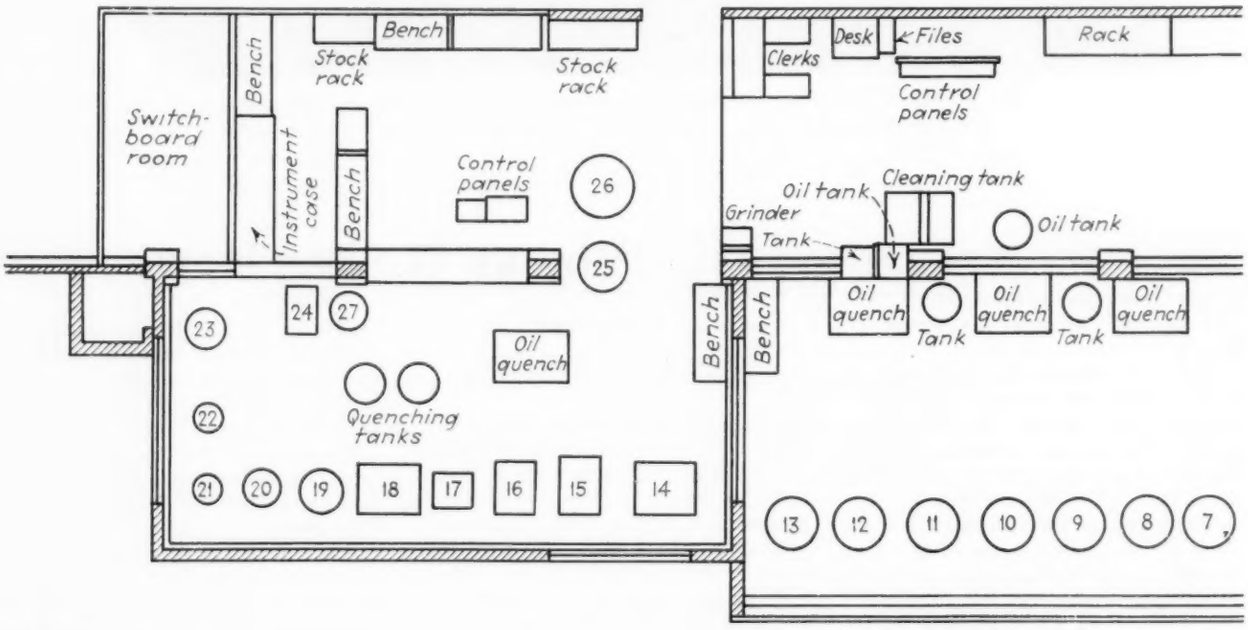
L. C. CONRADI
Metallurgist
International Business Machines Corporation

SIMULTANEOUSLY with the renovation and rearrangement of the plating department, (*AM*—Vol. 80, p. 537) we did a similar job in the heat-treating department at the Endicott plant of International Business Machines Corporation. Here again the management wished to avoid putting up additional buildings, and space was decidedly limited in the basement area assigned to heat-treating.

The obvious approach to the problem was through modern equipment and the result is shown on the floor plan illustrated. About $20,000 was spent in the heat-treating department and the outcome has been quite as satisfactory from an economy standpoint. Other units will be installed as the occasion arises.

Most of the parts for the business machines made at Endicott are relatively small and light, which dictated the choice of heat-treating equipment. These parts are given cyanide, Aerocase or carburizing treatments, depending

Floor plan of basement heat-treating department showing arrangement of equipment details of which are given in the table



NO.	TYPE OF FURNACE	MAKE	SIZE
1	Annealing and carburizing (gas)	Tate-Jones	3x6-ft. hearth
2	Annealing and carburizing (gas)	Tate-Jones	2x4-ft. hearth
	These two furnaces were originally oil fired, but were rebuilt and changed over to gas fired		
3	Annealing and carburizing (gas)	Surface Combustion Corp.	24x48-in. hearth
4	Vertical electrical carburizing furnace	Hevi-Duty Electric Co.	10x20-in. retort
	Used to anneal small parts which cannot be conveniently packed, but its principal use is for carburizing small parts which cannot be conveniently packed. City gas is used for the carburizing at the rate of 10-12 cu.ft. per hour. Gas is bubbled through Genzol to make it carburize more effectively at 1550 F.		
5	Rotary gas carburizer	American Gas Furnace Co.	7½x30-in. retort
	Used to carburize and anneal miscellaneous small parts which are of such size and shape that a slight amount of tumbling will do them no harm. City gas or solid carburizer can be used with this furnace		
6	Car bottom furnace, 2 cars	Surface Combustion Corp.	4x8-ft. hearth
	Used to anneal cast iron to remove casting strains and to anneal magnetic iron to secure the proper electrical characteristics. Will take a load of 4,000 lb.		
7	Gas-fired pot furnace (cyanide)	Surface Combustion Corp.	12x12-in. pot
	Used to obtain cyanide case depths up to 0.003 in.		
8	Aerocase pot furnace	Surface Combustion Corp.	12x18-in. pot
9	Aerocase pot furnace	Surface Combustion Corp.	12x18-in. pot
10	Aerocase pot furnace	Surface Combustion Corp.	12x18-in. pot
11	Aerocase pot furnace	Surface Combustion Corp.	12x24-in. pot
12	Aerocase pot furnace	Surface Combustion Corp.	12x18-in. pot
13	Aerocase pot furnace	Surface Combustion Corp.	12x18-in. pot

Pot type furnaces in which Aerocase bath is used to obtain a case depth as follows:

0.003-0.005-in.	15 min.
0.006-0.008-in.	30 min.
0.012-0.015-in.	1 hr.

These cyanide and Aerocase furnaces are well adapted for treating small parts which require only a comparatively shallow case depth. As a general rule for case depths in excess of 0.008-in. we prefer to use either the solid or gas carburizing method in order not to tie up either cyanide or Aerocase equipment on heats in excess of one hour

upon their size and thickness, and on their service requirements. General specifications have been worked out for them by the metallurgical department.

For parts made of carbon and alloy steels with not more than 0.25 carbon, which require a hard surface and tough core, two specifications apply; 0.001 in. max. and 0.002-0.003 in., standard cyanide case depth. These are for parts that are not to be ground after heat-treatment. The first is for parts needing only a very shallow case such as small rivets, screws and nuts. The other it to be specified for parts that need a somewhat heavier case.

Four standard case depth specifications have been written for parts to be treated in the Aerocase bath. Three of them are 0.003-0.005 in.; 0.006-0.008 in.; and 0.012-0.015 in., and are for parts that are not ground subsequently. The fourth one, 0.016-0.020 in., is for parts that may or may not require grinding. Draftsmen who are to use these standards are warned that the cyanide and Aerocase treatments are best suited for parts that need only a relatively shallow case, and that are not ground after treatment. Also, that a tough core of ample section is essential and that due allowance for this must be made when specifying the treatment to be used. They are also required to get the approval of the metallurgical department if a case thickness of 0.012-0.015 in. or 0.016-0.020 in., involving more than an hour in the bath, is thought necessary.

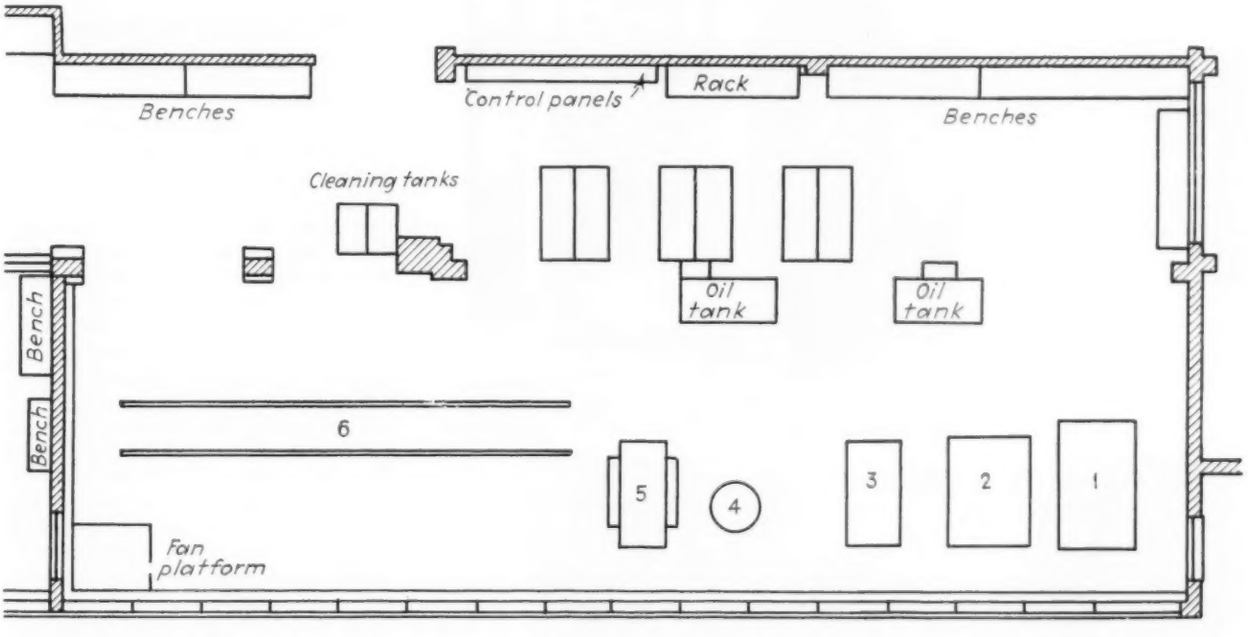
For localized cyanide or Aerocase treatment two ways of using cyanide copper plate are specified. The first requires complete cyanide copper plating of the whole piece and removal of the plate from the portion to be hardened, by machining, shaving or grinding. The second involves the use of suitable plating tray fixtures that will keep the parts to be hardened out of the plating bath. Rivet tenon ends are handled in this fashion.

Where parts with thicker sections are to be hardened, carburization may be specified. It is not suited to thin sections because of the danger of complete penetration and consequent elimination of the tough core. It is also specified on parts needing local hardening at one or two points whose size or peculiar shape does not permit Aerocase treatment.

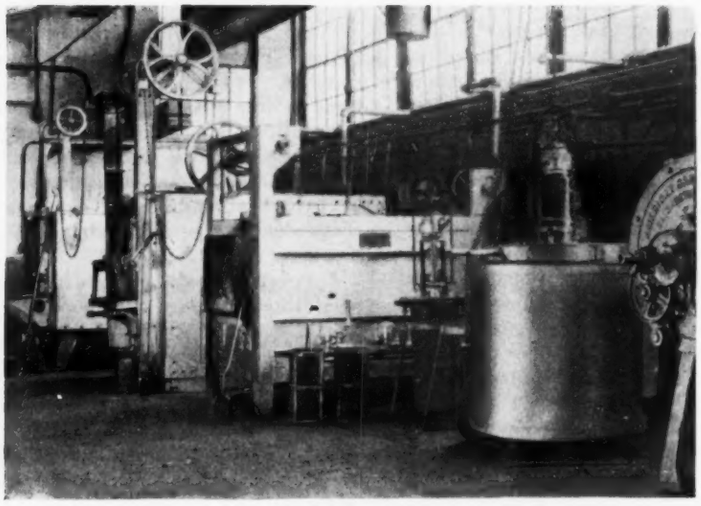
For parts not to be ground after treatment three standard case depths may be specified; 0.005-0.010 in.; 0.010-0.015 in.; and 0.015-0.020 in. For parts that may or may not be ground afterwards there are two specifications; 0.020-0.030 in. and 0.030-0.040 in.

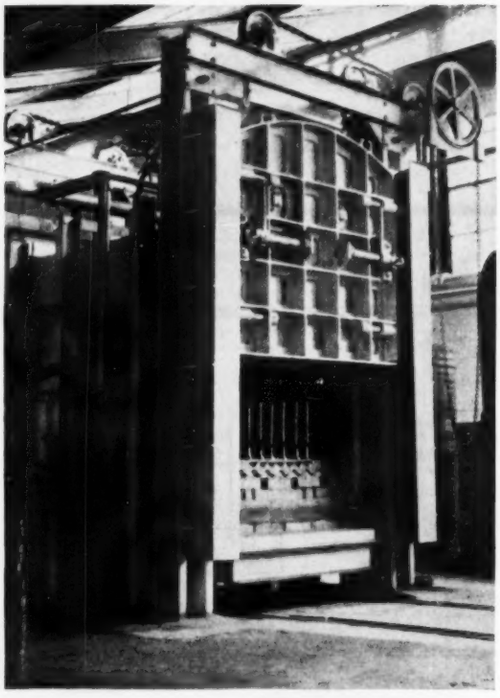
Two ways of obtaining local hardening are specified—all-over cyanide copper plate with subsequent removal of the plate from portions to be hardened, as mentioned before; and painting with "non case" cement of the portions that are to remain soft.

Specifications for heat-treatment of



14	Certain Curtain Globar type furnace	C. I. Hayes Co.	10x18-in. hearth
15	Hevi-Duty Electric furnace, resistance wire type Equipped with gas curtain at the door to obtain atmospheric control in heating chamber. Used for heat-treating high speed, high carbon, high chromium die steel and stainless steel	Hevi-Duty Electric Co.	12x36-in. hearth
16	Small gas tool hardening furnace	Surface Combustion Corp.	15x28-in. hearth
17	Small gas tool hardening furnace Used for rehardening and reheating miscellaneous carburized work as well as the hardening of carbon tool steel parts	Surface Combustion Corp.	9x14-in. hearth
18	Nitrate salt drawing bath, gas-fired This bath is used for temper drawing and bluing		15x24-in. pot
19	Lavite pot type gas-fired furnace Used to heat-treat miscellaneous small carbon steel parts which must be hardened absolutely scale free	Surface Combustion Corp.	12x18-in. pot
20	Pot type gas-fired temper drawing bath using nitrate salts	Surface Combustion Corp.	12x12-in. pot
21	Pot type furnace for cyaniding small parts—gas	Surface Combustion Corp.	10x6-in. pot
22	Gas-fired lead pot furnace for annealing and hardening small parts	Surface Combustion Corp.	6x10-in. pot
23	Gas-fired lead pot furnace for annealing and hardening somewhat larger parts	Surface Combustion Corp.	10x12-in. pot
24	Nitrate drawing bath for tempering and drawing	American Gas Furnace Co.	15x24-in. pot
25	Homo tempering furnace (electric) This furnace is used for temperatures up to 1,200 F. for temper drawing on carbon and alloy steels	Leeds & Northrup Co.	14x17-in. basket
26	Homo tempering furnace (electric) Used for temperatures up to 800 F. primarily for heat-treating beryllium copper parts at 530 F. and is also used for temper drawing miscellaneous small parts	Leeds & Northrup Co.	22x25-in. basket
27	Hump furnace (electric) Used to heat treat carbon tool steel dies.	Leeds & Northrup	12x16-in.

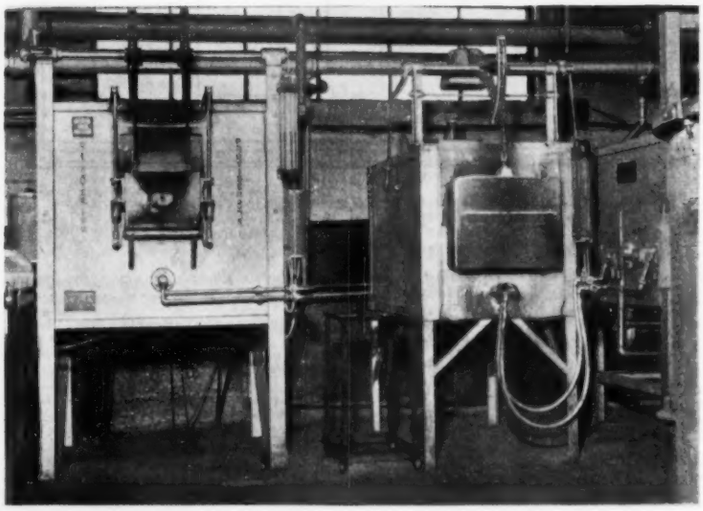




• *Gas-fired annealing and carburizing furnaces designated 1, 2, 3 and 4 on the floor plan*

• *Car bottom annealing furnace used to relieve strains in iron castings and to treat magnetic iron. Shown at 6 on the floor plan*

• *Electric furnaces for treating stainless, high speed and die steels. See 14 and 15 on the floor plan*



steels containing more than 0.25 carbon, including tool steels, are supplied by the metallurgical department to meet the particular service requirements of the part involved. In fact, the material and heat-treating specifications on all drawings must be approved by the metallurgical department before they are released to the manufacturing division.

To remove strains from iron castings before machining they are annealed at 1,125 F. in the car bottom furnace illustrated. It is heated by gas and is used also for annealing magnet iron to obtain the proper electrical characteristics.

Two Homo furnaces have been installed, one for annealing beryllium copper, operating at 530 F., the other for temper drawing of carbon and alloy steels up to 1,200 F. Both are electrically operated. International Business Machines Corporation is one of the largest users of beryllium copper alloy parts. Further details of the furnace equipment are given in the table accompanying the department layout.

Modernizing an Arsenal

JOHN R. GODFREY

Having spent much time in various arsenals both before, during and since the war, the articles by Captain D. G. McGregor are of great interest. They show a clear cut appreciation of the mechanical problems involved that are in marked contrast to those of the average arsenal officer of twenty years ago. It is particularly gratifying to note the realization that too strict specifications may easily prevent the purchase of the latest and best designs.

The effect of the human factor on performance of even the best machines is also recognized. Many large plants find that it pays to "sell" a new machine to the foreman and even to the man who is to operate it before it comes into the shop. One superintendent I know "suggests" to his foreman and operator that they go to a shop where one or more of the machines are in use and see how they like it. The demonstrator can also do much toward making the machine a success as Captain McGregor says.

The Ordnance Department and the country at large are fortunate in having officers with such advanced views on the mechanical side of arsenal work. From observation in other arsenals and navy yards, there is good reason to believe that Captain McGregor is typical of the newer generation in this line.

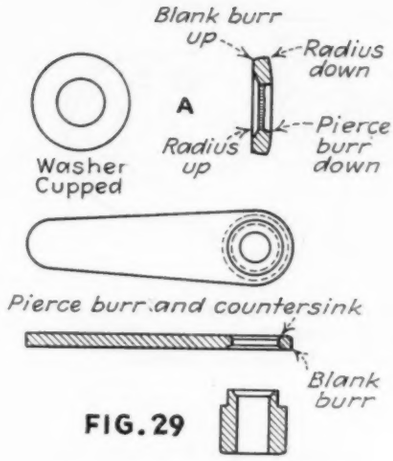


FIG. 29

Fig. 29—Parts like the washer at A are better made in a compound die to prevent cupping. Advantage is taken below of the cupping to get a neat-appearing riveting job

DIE DESIGN and DIE MAKING

VII—Almost any combination of standard die operations can be used in progressive dies

E. G. MARSHALL

Master Mechanic, Charleston Works
The American Fork & Hoe Company

AS THE NAME implies, progressive dies advance the stock from one operation to another. Such dies may combine only simple piercing and blanking, or they may involve a number of dissimilar operations such as piercing, numbering, notching, forming, extruding, trimming and blanking.

Certain precautions must be observed by the designer during the layout of progressive dies. First, the piercing holes must not come too close to the blank opening. Blanking should be the last operation and the blank should fall out the bottom. When an extrusion is called for, it should extend upward so as not to catch in the die and interfere with the stock feed.

In a progressive pierce and blank die, the blank burr is on one side of the stock and the pierce burr is on the other side. Advantage can be taken of this fact, Fig. 29 being an example. It shows a pierced arm below which is to be riveted to a hub. The pierce and blank burrs, being on opposite sides, act to cup the material around the hole. The side with the blank burr is placed down on the hub in assembly. When riveted, the cup is smashed down and there is no gap between the arm and the outside diameter of the hub at the shoulder. If this part were assembled with the other side down, the inspector might reject the assembled part on the score of bad riveting. Moreover, all of the good section of the hole is retained by countersinking on the side with the pierce burr.

Fig. 29 also shows a washer at *A* made in a progressive die. As the part was intended as a spacer, it should be perfectly flat. The trouble of cupping was corrected by making the part in a compound die.

The required production influences the choice of the progressive die to be used. For a small number of parts, the type employed between planish blocks is most economical (*AM*—Vol. 80, page 305). A die of this type, to make the pierced arm of Fig. 29, would have the following essentials: First, a pierce hole; second, the blanking opening, and third, the sight hole. The stock is fed in from the front and up to the blanking opening. The piercer is then put in and the press tripped. Next the stock is fed up to the sight opening, and the punch put in the locater plate. This punch has a pilot pin that enters the previously pierced hole and locates the stock in the correct position. When the press is tripped a second time, the finished part drops out of the blank opening.

The die block for this die should be made of oil or water hardening tool steel, and the blanking punch of tool steel. The blanking punch is made smaller than the part size by the amount of clearance required for the thickness of the stock, whereas the piercing punch is made the size of the hole, plus an allowance of 0.0005 in. per $\frac{1}{8}$ in. of stock thickness. The piercer is made of drill rod or tool steel, and the pilot pin for the blanking punch is made of drill rod and hardened. Stock guides are made of cold-rolled steel. In this type of die a piercer that is smaller than $\frac{1}{4}$ in. in diameter will not work satisfactorily.

Another type of low-production pierce and blank progressive die is shown in Fig. 30. This type is recommended for small parts with small holes. It is used between planish blocks like Fig. 15 (*AM*—Vol. 80, page 377). Die block *A* is shaped down to $\frac{1}{2}$ in. thick from $\frac{5}{8}$-in. thick oil hardening tool steel. This material is used to avoid distortion as much as possible in hardening. The top surface is ground for easy layout. Die block, stripper and punch plate are clamped together and bored for the guide pins, the piercing holes and the inner radii in the blank opening. The radii for the blanking punch are not bored in the punch plate. This insures the correct location of the upper and lower member. The die block is then heated to a purple color to make the layout lines stand out. After the bench man lays out the slot and blank opening, the slotter hand removes the excess metal inside these lines, leaving a little to be removed by hand to bring the

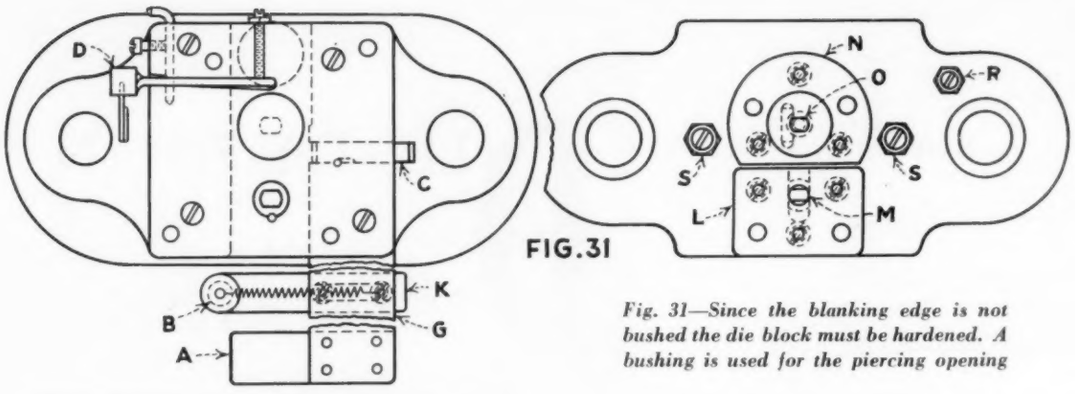
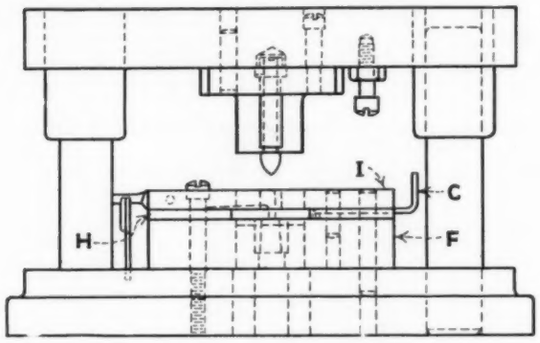


FIG.31

Fig. 31—Since the blanking edge is not bushed the die block must be hardened. A bushing is used for the piercing opening



openings to size. Clearance holes for the heads of the stripper screws are drilled. Dowel and screw holes for attaching the guide strips are drilled, tapped and reamed, and the die is then ready to harden.

Stock guide *B* is made of cold-rolled steel and casehardened. It is screwed and doweled to the die block and must be parallel with the center line of the pierce and blank holes. The other stock guide *C* contains springs to keep the stock rubbing against the guide *B*. The thickness of both guides is $\frac{1}{8}$ in.

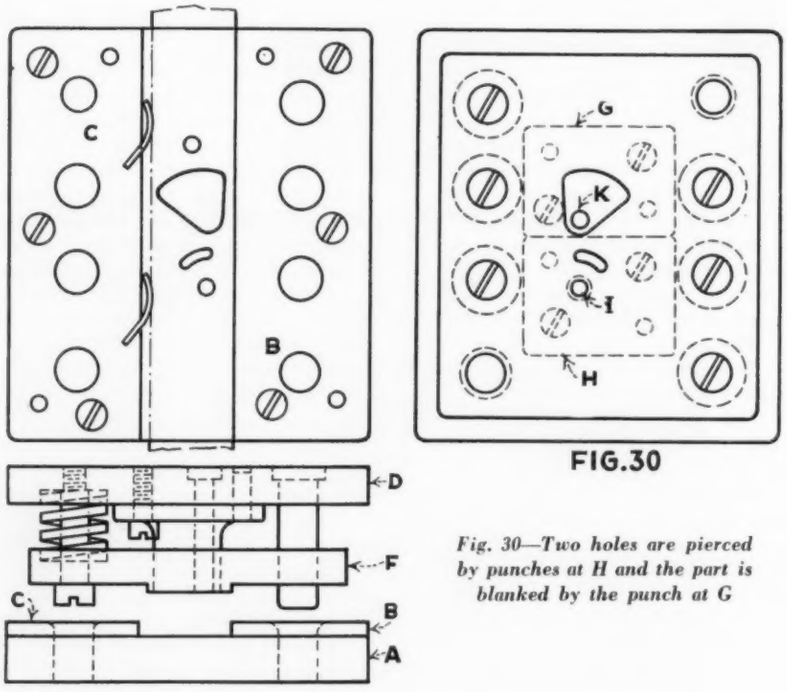


FIG.30

Fig. 30—Two holes are pierced by punches at H and the part is blanked by the punch at G

Punch plate *D* is made from $\frac{3}{8}$-in. thick cold-rolled steel and is of the same over all size as the die block. Guide pins are a drive fit in this plate, and the stripper screws are attached to it. The round piercer is a drive fit and the other punches are screwed and doweled to the lower face.

Stripper *F* is made of cold-rolled steel, $\frac{3}{8}$ in. thick. The bottom is milled at each side to a depth that is equal to the difference between the nest plate and the stock so that the stripper will bear on the stock and the nest plates at the same time. It is a snug sliding fit over the pilot pins and punches, so as to guide the working ends. Springs press the stripper downwards at all times.

Punches *G* and *H* are made of tool steel. The working ends are laid out from the hardened die block and roughly machined. They are then sheared in the die and finished to the sheared impression. The proper amount is removed to give the correct clearance to suit the stock. Punch *G* is bored for the pilot pin *K*. After the screw and dowel holes are drilled, tapped and reamed, the punches are ready for hardening.

Piercer *I* is made of tool steel and hardened. It is a drive fit in the punch plate and a slip fit in the stripper. The pilot pin is made of drill rod and hardened. The large end is made 0.0005 in. under the low limit of the pierced hole and the small end is made a drive fit in the punch. The large guide pins are made of tool steel, hardened and ground. They are of different diameters so that the die cannot be put together incorrectly.

It is not good practice to design progressive dies for universal holders. The presses are usually not in good enough condition, and the dies are rarely set carefully enough. As a result the die wears so rapidly that satisfactory results are not obtained.

High-production pierce and blank

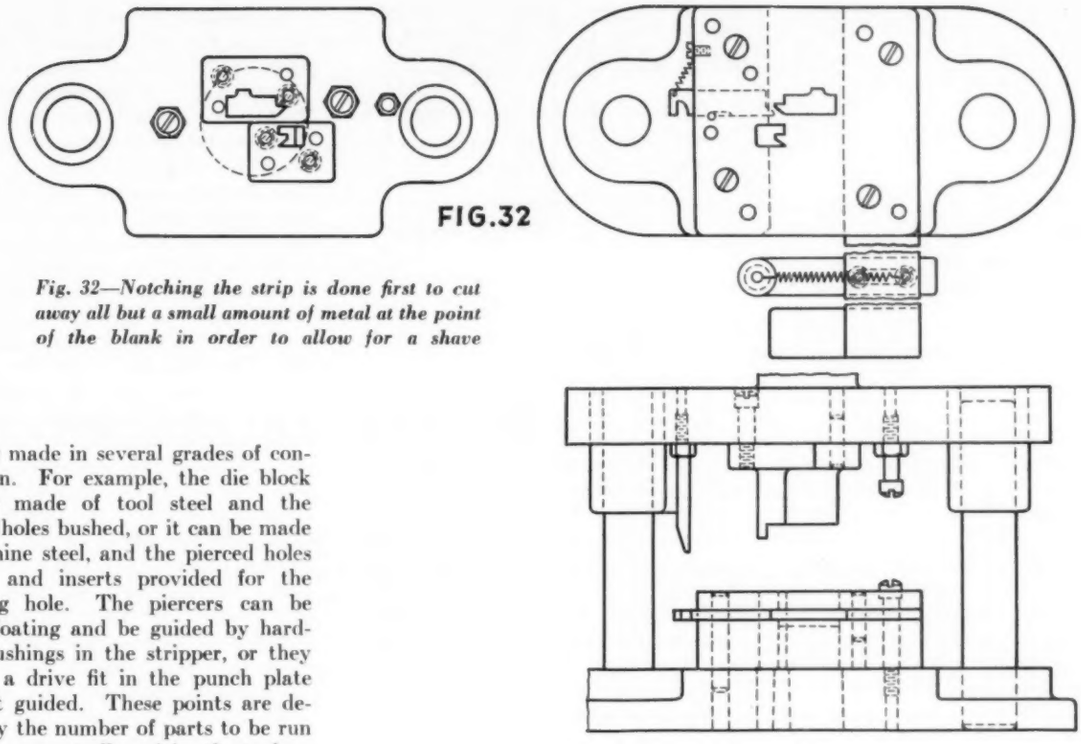


FIG.32

Fig. 32—Notching the strip is done first to cut away all but a small amount of metal at the point of the blank in order to allow for a shave

dies are made in several grades of construction. For example, the die block can be made of tool steel and the pierced holes bushed, or it can be made of machine steel, and the pierced holes bushed and inserts provided for the blanking hole. The piercers can be made floating and be guided by hardened bushings in the stripper, or they can be a drive fit in the punch plate and not guided. These points are decided by the number of parts to be run and the amount allowed for the tools.

A pierced gear blank is produced from ⅛-in. stock in the tools shown in Fig. 31. The stock is entered from the front, passing over the support plate *A* and through the tension roll *B* and the stock guide. The first blank stop *C* is pushed in to stop the stock and to pierce the first hole. The stock is then pushed up to the automatic stop *D* and the strip is ready to run.

A standard sub press is used for this die. Die block *F* is made of hardened tool steel, because an insert is not used for the blanking edge. In laying out the die block care must be exercised to avoid a mistake in the stock advance as this would mean a new die block at least. The center of the pierce hole must be far enough from the center of the blank hole to leave scrap between the blanks equal to the stock thickness.

Put the die block on the jig borer and bore the blanking hole to size, and also bore the hole for the piercing bushing. Leave a shoulder to support the bushing. Make the blanking hole straight at the top for ⅛ in. and give it a ½ deg. taper for the rest of the way. Dowel holes can be drilled and reamed, allowing stock for lapping after hardening. Clearance holes for the screws can be drilled. A plug is fitted in the bushing hole and the hole for the small dowel is drilled and reamed.

The cold-rolled stock guide *C* has a stock support *A* welded to it on the end in front of the die. The support is located at 6 to 7 in. from the edge of the die block, and at a distance of about 3 in. from the die block there is a tension slide *K* and roll *B* to hold the stock against the stock guide. The guiding edge must be exactly parallel with the centerline of the pierce and blank openings. At the point where the stock swells when blanked, a $\frac{1}{32}$-in. clearance is cut so that the stock strip will not be forced sideways. Spacer *H* is made of cold-rolled steel the same thickness as stock guide.

The stripper *I*, made from ⅜-in. cold-rolled steel, has a bushing to guide the piercer. It is cleared $\frac{1}{64}$ in. all around for the blanking punch. The piercer bushing must be perfectly in line with the die bushing. A slot is milled in the stripper for the automatic stop to work in.

The first blank stop *C* is made of cold-rolled steel and casehardened. It is manually operated and must never be placed to allow the blanking punch to cut part of a blank. Auto stop *D* is likewise made of cold-rolled steel and casehardened. It is placed so that it will stop the strip when the pierced hole is in the correct position in relation to the blank outline.

Tension slide *K* is made of cold-rolled steel and casehardened. It is attached under the stock guide with shoulder screws that permit it to slide freely. It is slotted to give about ⅛ in. travel each way of the stock width. Tension roll *B* rolls around the stud riveted to the end of the tension slide. The diameter of the stud is larger than the roll to hold the stock from working up off the roll. A spring keeps the slide under the proper tension.

Punch plate *L* is made of ½-in. cold-rolled steel, and it is screwed and doweled to the upper member. The piercer *M* is a drive fit in it. This part is made of tool steel, hardened and ground. The end in the punch plate is made round to save time in making the hole in the punch plate. A heel on the end has flat sides to prevent the punch from turning in the punch plate, and the flats are ground on the working end after hardening. The piercer is guided in the stripper.

Punch *N* has a hole bored in the center for the pilot pin *O*. A slot is milled in the top end to hold the key which prevents the pilot pin from turning. The punch is screwed and doweled to the upper member. The pilot pin is made in 0.0005 in. smaller than the low limit of the pierced hole, and where it fits into the punch it has a snug sliding fit. Screw and nut *R* operate the auto stop, while the two screws and nuts *S* are limit screws to prevent the punch from dropping down when out of the press and thereby breaking the automatic stop.

Sometimes it is necessary to divide blanking operations in order to prevent

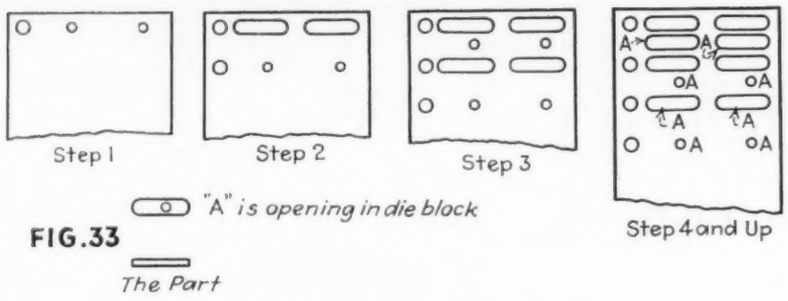


FIG. 33

Fig. 33—To get away from a weak die block the stock advance was made to jump two spaces

damage to sharp ends or points in the blank outline. Fig. 32 shows a blank and shave die. The part has a sharp point at one end only 1/32 in. wide. This point would crush down badly in blanking and therefore a shave was used on the point in the blanking operation to help straighten it out. This was done by notching the stock to the shape of the pointed end, and when the part was blanked, the blank opening shaved the notched end. This process reversed the burr and filled out the rounded end. Then, a second shave die gave a neat job all around.

The stock enters at the front of the die, passes over the stock support and between the tension roll and the stock guide, as shown previously in connection with Fig. 31. The notch opening is 0.005 in. larger on a side than the blank opening to allow for shaving. The blank opening is the size desired for the finished part. The walls of the notch opening are straight and the blank opening is straight for 1/8 in. and then tapered 1/2 deg.

Because a notch is used instead of a blank opening, the automatic stop used in this die is different from that shown in Fig. 31. The automatic stop is the same thickness as the spacer, the spacer being cut in two pieces. They are located by dowels.

A special case of stock advance is shown in Fig. 33. The part is an oblong piece with rounded corners and a pierced hole. If the usual stock advance were allowed; that is, the stock thickness between blanks, the die block would be weakened to such an extent that the web between the blank openings would break. Therefore, the die was made with the blank holes three times the stock advance apart, and the stock advanced two spaces. Three first blank stops were used to start the strip until the automatic stop came into play. In step No. 1 the two pierced holes for two rows of blanks were pierced, and also the hole for the automatic stop. In step No. 2 the stock is advanced twice the usual stock advance. Here three holes are pierced and two blanks are finished. In step No. 3 the three holes are again pierced, the second two blanks are cut out and the second set of two holes are pierced. In step No. 4, and after the automatic stop is used, the openings marked *A* are in the die and are done at this step, the others being done at previous steps.

By this layout a strong die block was obtained, and the scrap between the blanks was kept at a reasonable figure. By using a double row of parts the labor cost was held down, although the tool cost was slightly more than for a single-row die.

Right Lubricant Prevents a Tie-Up

J. HOMEWOOD

IF THERE ARE any die-hards who still think that the psychology of a bonus is all wrong, let them read the following:

During the World War it was my pleasure to assuage labor, see to it that machines were kept in repair, humor munition inspectors, and insure a constant output of high-explosive shells. Inasmuch as our plant was situated in the remote wilds of the Alberta prairies and we had no machines we could call upon for emergencies, it was necessary to anticipate repairs by constant vigilance.

For one of our roughing operations, on the base end of the 4.5, we used an old 36-in. vertical boring mill. This machine was in constant use and from all appearances consisted of a revolving table and stamina of eternal endurance. I cannot recall the make of this machine, but of a certainty it was an old timer with the constitution of a rock crusher. It kept pace with the rest of the machines and particularly did it emulate the diminutive, red-faced operator—a former carpenter—whose brows were constantly bathed with steaming salt drops.

Just as we were all straining our interior anatomy to do our very best to make a monthly output record, our old reliable boring mill suddenly buckled in the knees, whined the last few notes of The Lost Chord and became inert. As the operator stood bewildered while the rest of the shop seemed to revolve about him, I approached to ascertain the cause of the inaction. Well, here was calamity staring at us; we were stuck!

We couldn't go off on a drunk, to drown our sorrows, because prohibition had transformed our recreational pastures to Death Valley aridity. As I paced the office floor, consoling with one of the firm's partners, hands behind me and my face wearing an expression of approaching doom, Old Mack sat at his desk supporting his heavily laden chin in profound cogitation. Suddenly he looked up: "Jack, I'll set you and the machinists up to two large bottles of ice cold beer each if you will get that machine running by Monday."

It was Friday night when the boring mill groaned, "I can't take it, Curley," and time was fleeting, but with such an incentive, we fought obstacles as did our less fortunate brothers in France, and as the golden sun was setting Sunday afternoon over the rolling fields of wheat, we went over the top to victory.

Oh, what a reward! It was a hot afternoon, too. Where Mack dug up the magic liquid we couldn't find out. He wore a smile of satisfaction as he surveyed a dozen empties and a group of harmonizing grease-covered individuals, singing that melody of brotherhood: "Sweet Adeline."

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 14
K. H. CONDIT • F. H. COLVIN
EDITORS

THE RAILROAD SHOPS

IT TAKES FIGURES to drive home facts. It has long been common knowledge that railroad repair shops are in dire need of modernization; *American Machinist's* 1935 Inventory showed that 71 per cent of railroad shop equipment was over ten years old.

Almost as his last official act as Federal Coordinator of Transportation, Joseph B. Eastman submitted a report on "Consolidation of Railroad Major Repair Shops and Modernization of Repair Shop Facilities." Some of the pertinent facts uncovered are:

1. Maintenance of equipment represents 27 per cent of the total railroad operating expense.

2. Locomotive repairs alone amount to $400,000,000 per annum.

3. Total charges to maintenance of equipment amount to $727,000,000 per annum (approximately $436,000,000 for labor).

4. Of all net expenditures made for additions and betterments to roadway and equipment during the 17½ year period to December 31, 1931, only 2.71 per cent was for improving shops and engine houses, only 1.23 per cent for improving shop machinery.

5. Once each 4.29 years an amount equal to the original cost of all locomotives is spent for their repairs.

6. Total deferred maintenance in locomotive and freight car accounts for the years 1930, 1931 and 1932 is $421,961,761.

7. If the average age of machine tools were to be maintained at 7½ to 8 years instead of 21.8 years as at present, the annual saving in repairs to machine tools would amount to $20,000,000 per year—87 per cent of the amount to replace all existing shop machinery in a period of 14 years.

The report also states that "The continued use of these obsolete facilities results in high costs of maintaining equipment, not only in respect to actual work performed, but also in respect to the quality of the work. This applies particularly to machine tool work, in which accurate dimensioning and close tolerances required for easy fitting and assembling, and minimum running repairs, cannot be secured without modern machine tools, even though older tools have been maintained in a condition as good as new."

LITTLE need be added except to suggest that those interested in the railroads and their future welfare examine Mr. Eastman's report for the additional evidence it contains.

Close Measuring

ALTHOUGH we have always boasted of our ability to work to close limits there have been some thoughtful souls among us who have wondered just how close we were really coming to those limits. These skeptics should get considerable comfort from the assertion of Hilding Tornebohm, chief engineer of SKF in Sweden, that precision of machine-tool performance is ahead of precision of measurement. Dr. Tornebohm's paper before the A.S.M.E. on this topic was printed almost in full in the last issue because we believed it to be a significant contribution to the art. After hearing him present it and seeing the measuring instruments described in the paper we are more than ever convinced that engineers and production men in this country should give his statements the most careful study.

Several engineers who heard Dr. Tornebohm are of the opinion that his device for measuring surface quality may be as important as the first hardness tester to give quantitative results. Be that as it may, this paper should serve to stir us out of our complacency and acceptance of methods of gaging that have been current for a generation.

Because of its presentation at the Dallas meeting of the A.S.M.E. this paper of Dr. Tornebohm's was heard by a mere handful of those who can discuss it or profit by it. Supplementary meetings at Providence and Detroit have helped somewhat, but we hope that our readers will study the paper as published in *American Machinist* and send us their comments so that we may publish them.

Chips

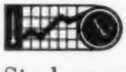
WASHINGTON— Unusually deserted was the Capitol last week . . . Congress had left it with a sigh of relief which found country-wide echo . . . Other interested parties sojourned to Philadelphia for the big Democratic doings . . . There delegates failed to heed Al Smith's call for a new leader . . . Instead they acclaimed the incumbent and, in their platform, all his works . . . Traditional two-third rules evaporated with other vestiges of the old order . . . But before leaving Washington Congress did its share of damage . . . Worst blows for industry were the tax and Walsh-Healey bills . . . Meanwhile Alf Landon quietly plans his campaign under John Hamilton's able guidance . . . Coughlinites, Townsendites and Share-the-Wealthers rally 'round Lemke in what may prove a thorn in the Democratic flank . . . Commission sent abroad to study European cooperatives.

FOREIGN—Anthony Eden ends sanctions against Italy to promote European peace . . . British planes attempt to halt Arab-Zionist rioting in Palestine . . . . Test of eight Bennet laws breaks Canada's "New Deal" . . . Japan retaliates against Australian tariffs by placing curbs on trade . . . German trade group sets sail for U. S. to talk tariffs . . . Blum government in France favors regional blocs to stop international aggressors . . . Dissolves *Croix de Feu* and other internal armed "combat groups" . . . Striking French sailors seize ships in Marseilles harbor . . . All-Union Congress of Soviets will speed new constitution and parliament in November . . . Renewed warfare reported between Cantonese forces and government troops in South China . . . Chinese claim Japan aids rebels.

FINANCE—Bonus bonds swamp Treasury while veterans wait . . . These plus new federal financing put public debt at $34,000,000,000 top . . . June income tax collections show 23 per cent rise over last year . . . RFC sells 32 bond issues taken over from PWA . . . SEC seeks new law to protect investors under trustees . . . N. Y. Exchange head Charles R. Gay protests Commission's rule to segregate functions of brokers and dealers . . . Bank of France cuts rediscount rate from 5 to 4 per cent in easy-money policy.

INDUSTRY—May finds 88,000 more workers back at jobs . . . Weekly payroll up $6,700,000 . . . Building employment rises 27 per cent . . . Steel industry reported planning ten per cent wage rise . . . President Roosevelt orders anti-trust action on "collusive" steel bids . . . New Orleans circuit court holds National Labor Board has no power over manufacturing . . . Chamber of Commerce adopts ten-point plan for recovery . . . New tax law may spur higher corporate dividends . . . Lewis hires 200 organizers to unionize workers in steel industry . . . Massachusetts drastically cuts machinery tax to hold Bay State industrial plants.

TRADE—Railroad earnings gain 41 per cent in May . . . Motorists paid $619,000,000 in gasoline taxes during 1935 . . . *Hindenburg* commanded by Hugo Eckener sets record for western Atlantic voyage . . . Chevrolet six months' sales set all time record . . . Used car stocks down for first time in eight months.



INDICATORS—Power output rose to new peak during week of June 20 . . . Steel operations hit six-year high . . . *Business Week* index advances slightly to 74.7.

Heads Niles-Bement-Pond

CLAYTON R. BURT

C. R. Burt Now Heads Niles-Bement-Pond

Clayton R. Burt, formerly president of Pratt & Whitney Co., was elected president of Niles-Bement-Pond Co., June 17. The company will move its headquarters from New York to Hartford, Conn. Mr. Burt succeeds Charles K. Seymour, who continues as treasurer.

The board was reduced from twelve to seven members, consisting of Col. Edward A. Deeds, chairman; Mr. Burt, Sydney Buckley, Philadelphia; Sandford E. Etherington and Mr. Seymour, of New York; Alexander S. Keller, Hartford, and G. H. Warrington, Cincinnati.

The Pratt & Whitney plant, formerly a subsidiary of Niles-Bement-Pond, was recently merged with the parent company.

The company voted a dividend of 50 cents a share on common stock, the first since March 31, 1932, when 15 cents was paid. Mr. Burt recently announced a plan of vacations with pay for employees.

Following a wide experience in the machine tool industry, Mr. Burt joined Pratt & Whitney in 1924 and became president in 1930. He had been with Brown & Sharpe Co., Providence, R. I., Barber-Coleman, Rockford, Ill., and during the war he equipped and operated four large munitions plants in Ontario, Canada, and two in Buffalo, employing more than 12,000 in manufacturing shells, fuses and gun mounts. He was honored by the British and United States governments for his work.

He is active in numerous civic affairs, and is first vice-president of the National Machine Tool Builders' Association and a director of the American Standards Association, New York.

Urges New Machine Tools to Reduce Cost of Railroad Locomotive and Car Repairs

Railroad Maintenance Equipment Obsolete, Eastman's Study Shows

An annual saving of about $20,000,000 per year would accrue to railroads if they reduced the average age of machine tools in their repair shops from 21.8 to seven-and-a-half or eight years old, Federal Coordinator of Transportation Joseph B. Eastman told executives of Class 1 railroads in a report issued June 12, in one of his last official acts as coordinator. He remains a member of the Interstate Commerce Commission, although the office of coordinator has been abandoned.

Under a general policy of renewal of machine tools on all railroads so planned that the average age would not exceed from seven-and-a-half to eight years, with an ultimate life of sixteen years, the annual repair cost would not exceed 1.2 per cent of the total investment, or $3,846,000, the report estimates. This would represent a reduction of $19,854,000 below the annual average of tool and shop equipment repair costs of $23,700,000 spent by the railroads, or 87 per cent of the amount needed to replace all existing shop machinery. Some machines are 43.6 years old.

High Obsolescence

The net retirements of existing inefficient shop equipment should amount to $284,343,901, a total of $86,150,000 worth of machines being good for ten years more of service, the survey showed. The present value of shop machinery is $320,493,201 in the 403 locomotive shops, 4,175 repair pits, 568 car shops and 3,271 roundhouses covered in the study. The exact number of shops now operating is not known, but the average age of the above shops is 20 years. The shop and machinery investment is about $1,000,000,000.

In many cases where earlier railroad consolidations took place, management failed to recognize the importance of maintenance or was financially unable to improve the situation. Many roads have continued to use repair equipment now obsolete and facilities hopelessly outgrown because of the increased number of units and their larger size.

It is pointed out, however, that some roads have consolidated their repair operations into the least number of shops possible, and have provided modern equipment. These railroads, the report said, have low operating costs and have paid regular dividends to their stockholders.

Specifically, the report concludes that:

"Railroad repair facilities, as a whole, include an unduly high proportion of obsolete buildings, machinery and accessory equipment," and points out that this not only results in high cost of maintenance, and prevents accuracy.

An important point made by the report was that because of the generally poor condition of many of the machine tools, many locomotives are held longer in the shop than they would need to be were the machines in better condition. This keeps far too large a proportion of motive power out of service at all times, the report said.

Answer Is Not Consolidation

"Consolidation or joint use by several railroads of existing major repair shops, would result in comparatively small savings," the report concludes after an exhaustive investigation into this proposal.

Even if any consolidation plan were undertaken, new machinery would be required to make the move one of economy.

"Neither redistributing work among existing shops nor installing new machinery in such shops can accomplish maximum attainable results."

For the ten-year period, 1923 to 1933, an average annual expenditure of $400,010,113 was spent on repairing locomotives by the railroads embraced in the study. These locomotives cost the railroads $1,717,697,850; hence every four and one-third years the repair bill amounts to the original cost, the report says. The average age of locomotives was 20.7 years at the time of the report, and up until 1932 nearly five times their original cost had been spent on repairs.

Increased size of locomotives have made roundhouse problems even more serious than those of locomotive shops. Modern handling equipment and machinery would speed up the work greatly, the report says. The average tractive power has increased from 31,250 lb. to 46,400 lb. during the past five years, a gain of 48 per cent.

The report says "There must be real national standardization in the matter of locomotive design, shop practices, limits of wear, and policy of renewals, especially when those shops must be used to repair locomotives of widely different design."

Industrial Centers Escape Usual Slump

Seasonal Recessions at Minimum in All Parts of Country

Manufacturing plants in industrial centers in eastern and midwestern states are escaping the seasonal summer slump in output this year, because of the vigor of the current recovery trend, the National Association of Purchasing Agents' business survey committee reports.

"Seasonal changes are being held at a minimum in all parts of the country, and there is a definite absence of fear of any noticeable setbacks in the immediate future," the survey says.

"A somewhat improved state of affairs has occurred throughout this country and Canada, and the underlying sentiment in all reports is that the fall and winter months should witness increased business volume."

Shortage of skilled labor in metalworking and other fields is being reported to the Association from most of the industrial sections of the country. Employment in June has been maintained on a par with May's rate.

A. M. MacCutcheon Heads Electrical Engineers

A.I.E.E. Elects Officers to Serve Beginning August 1

A. M. MacCutcheon, engineering vice-president, Reliance Electric & Engineering Co., Cleveland, was elected president of the American Institute of Electrical Engineers for the year beginning August 1. Other officers elected were: vice-presidents, A. C. Stevens, Schenectady, N. Y.; O. B. Blackwell, New York; C. Francis Harding, Lafayette, Ind.; L. T. Blaisdell, Dallas, Texas; C. E. Rogers, Seattle. Directors will be K. B. McEachron, Pittsfield, Mass.; C. A. Powel, East Pittsburgh, Pa.; R. W. Sorensen, Pasadena, Calif. The national treasurer will be W. I. Slichter, New York.

Aircraft Production Continues Up Trend

Quarter's Output Is One-Third Above Last Year's Like Period

Continuing the upward trend which began in 1934, production of aircraft in the United States during the first quarter of 1936 rose 33⅓ per cent over that for the corresponding period of last year, according to Eugene L. Vidal, Director of Air Commerce, Department of Commerce.

A total of 456 airplanes were manufactured during the first quarter of the current year, as compared with 349 for the same period last year. Light airplanes, of the private-owner type, showed an increase of 28 per cent.

Of the total, 216 were for domestic civil use, 153 were delivered to military departments and 57 were exported. Eight of the 56 companies or individuals producing airplanes for domestic civil use during the first quarter manufactured 74 per cent of the total.

A.S.M.E. Holds National Applied Science Sessions

Fourth Meeting at Pittsburgh Has Wide Range of Topics

The fourth national applied mechanics meeting of the American Society of Mechanical Engineers was held June 11 to 13 at Carnegie Institute of Technology, Pittsburgh.

Professor N. C. Riggs, Carnegie Institute, presided at the session on general mechanics. "An Electrical Resistance Method of Determining the Steam Surface Temperatures of Tubes" was discussed by John H. Marchant, Columbia University. Professor William Howard Clapp, California Institute of Technology, presented a paper on "An Efficiency Equation for Gears." Professor E. O. Waters, Yale University and Professor Max M. Frocht, Carnegie Insitute, presented papers on "An Analysis of General Bearings of Finite Length" and "An Approximate Method for the Determination of Principal Stresses," respectively.

Other sessions on thin-walled structures, plastics, flow and creep, and vibration were also held.

At the annual dinner, June 13, Professor Hollister talked on "The Scientific Study of Coulomb."

BUSINESS ITEMS

Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., has appointed F. D. Baker, District Representative in Central and Northwestern Ohio, at 17545 Madison Ave., Lakewood.

New Britain-Gridley Machine Co., New Britain, Conn., has appointed J. Leslie Lenton its western representative with headquarters in Chicago.

Michigan Tool Co., Detroit, has appointed Brammer Machine & Tool Service, Tulsa, Okla., its Kansas, Oklahoma and northern Texas distributor.

Haynes Stellite Co., 205 East 42nd St., New York, has appointed F. P. Shephard district sales manager at Cleveland. He will take over the position formerly held by the late W. A. Moore. Mr. Shephard has been connected with the cutting tool industry for more than 20 years.

Joseph Bauer, 200 Broadway, New York, is now sole distributor for the patented "Down-Grip" machine vises, formerly handled by C. R. Gier Co., 75 West St. The vise has been described (*AM*—Vol. 79, p. 414).

PERSONALS

LEON C. BIBBER, formerly senior welding engineer, U. S. Navy bureau of construction repair, has been appointed welding engineer of Carnegie-Illinois Steel Co., Pittsburgh.

J. G. BLUNT, mechanical engineer, American Locomotive Co., has been appointed chief mechanical engineer of the company with offices in Schenectady, N. Y.

L. R. BUCKENDALE has been elected vice-president in charge of engineering of Timken-Detroit Axle Co., Detroit. He has been executive engineer of the company for several years.

P. E. GARLAND, formerly master mechanic for Timken-Detroit Co., has been appointed assistant works manager of the Federal Mogul Corp., Detroit, bearings and specialty manufacturers.

M. B. MCPARTLAND, formerly superintendent of motive power, Western Pacific Railroad, has been appointed general superintendent of motive power, Chicago, Rock Island & Pacific, succeeding P. J. COLLIGAN, retired.

DAVID PRYDE, formerly works manager, Superior Steel Co., Pittsburgh, has been elected vice-president in charge of operations.

HERBERT W. SNYDER, mechanical engineer, Lima Locomotive Works, Inc., Lima, Ohio, has been appointed works manager in addition to his other duties.

H. H. WEHRHANE has been elected president of Standard Stoker Co., Inc., 350 Madison Ave., New York, following the recent death of W. C. PEYTON. R. E. COULSON, F. P. ROESCH and E. A. TURNER were elected vice-presidents, W. D. GRAY, secretary, and B. PEYTON, treasurer.

Watching Washington

New order envisioned at Philadelphia . . . Labor plank left to Lewis . . . Walsh-Healey bill put over by parliamentary sleight-of-hand . . . Madam Perkins becomes industry's dictatress

WASHINGTON—Last week "Watching Philadelphia" would have been more like it, except for one thing—delegates at the Quaker City wrangled and cheered but followed closely a remote control which until Saturday night remained at the Capitol. Then came a good old-fashioned political mass meeting at Franklin Field. Acclaimed again, Roosevelt and Garner bowed to the demands of their party and accepted its mandate to carry the Democratic standard once more.

In all of this there was no element of surprise—not even enough to hold more than half the tired delegates in Philadelphia for the final sessions after they had hollered and paraded in an hour-long demonstration on Friday. Even Al Smith's long distance call for another leader failed to supply enough new business to give the gathering a much needed note of spontaneity.

Routine as it was, the Democratic Convention was not without significance. No new thought was to be found in the remarks of Keynoter Barkley, in the speech of Chairman Joe Robinson or even in the nominating address of Judge Mack. Things for the country to think about were confined to the Democratic platform and to the President's own words of acceptance.

Earlier Platform Scrapped

Four years ago the Democratic party drew up another platform which was subsequently scrapped by the President himself because of the pressure of an "emergency." Executive powers were greatly extended; government took a hand in affairs long considered beyond its scope and authority; public spending soared to "prime the pump," to supply the buying power lacking in private business.

Democrats now take full credit for the passing of the emergency. They contend that in three years they have undone some of the damage which they attribute to twelve years of Republican power. But they do not anywhere indicate a relinquishing of executive domination of government, a return to fuller exercise of individual business initiative or a curtailment of large federal outlays.

The New Deal has been transformed from a temporary policy, designed to meet a specific set of conditions, to a philosophy of government that breaks sharply with the past. No attempt to link the Philadelphia platform of 1936 to the Philadelphia declaration of 1776 will disguise this fact. No pairing of Georgian royalists with present-day economic "royalists" will create a true parallel between the freedom fought for 160 years ago and the paternalistic program proposed in the platform and by the President at Franklin Field.

Party's Care For All Plan

Now, for the first time in the country's history, a major political party undertakes to take care of everybody against practically every contingency. An industrial worker should have a job, to be sure, and a farmer his crops. But without job or crops they need not be unduly disturbed because a kindly government has "insured" them. The struggle for a livelihood will have lost much of its sting, not to say much of its urge; mortgages or other debts will not prove too onerous with a benevolent bureaucracy ready to help those who do not help themselves. If indeed the patriots of 1776 could look upon this concept they would be startled at the twist put upon their struggle to carve out their own destinies.

There is no disparity between the platform and the President. It may be assumed that the platform received his blessing in advance; he indorsed it without reservation in his acceptance speech. The only section not wholly his own was the labor plank, for which the President obligingly deferred to John L. Lewis, president of the United Mine Workers of America, who now seeks fresh fields to conquer.

Without wishing to bring up again an unpleasant subject, a word is necessary on the late Congress. In the week that elapsed between the two political conventions legislators took a few parting shots at business.

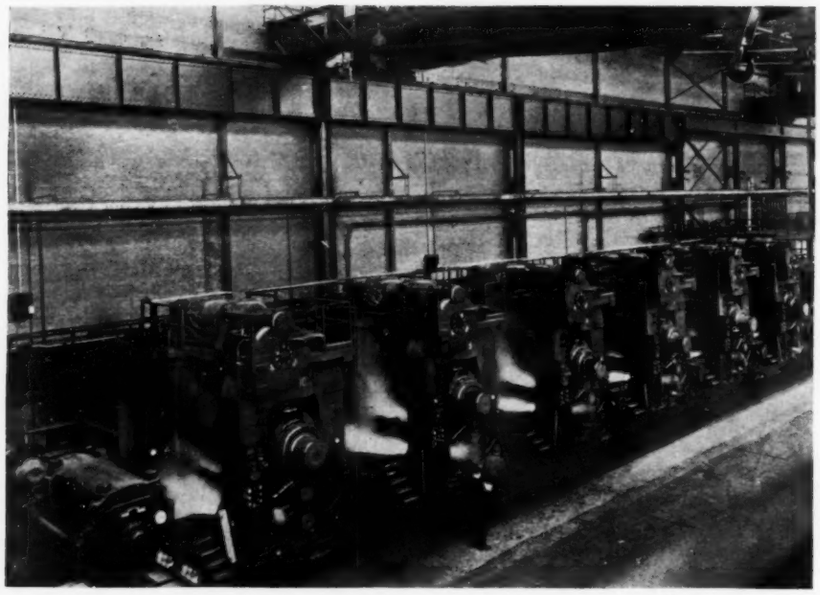
In the tax bill finally passed it again bowed to Presidential pressure to preserve the pet soak-the-surplus provision. With levies graduated from 7 to 27 per cent, based on proportion of earnings, the bill is much more than a gesture toward Rooseveltian principles. In addition, the penalties on bigness, initiated in last year's revenue bill, are made far more drastic with the normal corporate income tax stepped up steeply from 8 to 15 per cent.

U. S. Suppliers Regulated

Through a parliamentary trick, the much discussed Walsh-Healey bill has passed during the last hours of Congress. The act authorizes Secretary of Labor Perkins to set up an establishment to supervise all concerns doing business with the government. Ninety days from enactment of this law all purchases by the government of over $10,000 must be made from companies which have first passed sanitary quarantine, labor and hour rules laid down. A violation means a three-year denial of government business.

The Lady Secretary may enter factories, investigate conditions, subpoena witnesses, force them to produce papers, apply penalties, withhold contract money and pay it to employees who have been underpaid or have worked under illegal conditions, fix minimum wages or suspend her own rules and wage schedules "when justice and the public interest will be served thereby." Thus has industry acquired a czarina.

Reverses continued to dog New Deal legislation when Justice Bailey in the District of Columbia Supreme Court declared unconstitutional the 1935 Railroad pension law. This action automatically invalidated the companion tax measure since the court declared that the two dovetailed "into one another so as to create a complete system." The government plans a quick appeal from the decision. It remains to be seen whether this new reverse will bring increased agitation by New Dealers for constitutional change or whether they count on nature and another term to change the Supreme Court's outlook.



From Slab to Strip—Slabs, elongated by the roughing train of mills, enter this finishing train at slow speed and emerge in light gage strip, traveling up to 1,350 ft. per min. at Bethlehem Steel Co.'s new continuous strip-sheet mill, Lackawanna, N. Y. Rolls are 79 in. wide and strip up to 72 in. is produced. Plant, opened June 30, has hot and cold mill departments; buildings cover 22 acres; annual capacity, 600,000 tons of strip, sheet and light plate

Schenectady Celebrates General Electric Event

Fiftieth Anniversary of Beginning of Edison Works Is Civic Affair

Commemorating the 50th anniversary of the establishment in Schenectady, N. Y., of the Edison Machine Works, now the General Electric Co., citizens of that city held a gala celebration June 12 and 13.

At a formal dinner a number of the 500 guests were original Edison pioneers who worked with the inventor during his early days at Schenectady. Among the speakers were Owen D. Young, chairman of General Electric Co., Charles A. Edison, son of the inventor, William S. Barstow, and Dr. George R. Lunn. Dr. Dixon Ryan Fox, president of Union College, was toastmaster.

AUTHORIZES SALE

Relay Plant to Go to Westinghouse, Federal Court Says

Receivers of the Relay Motors Corp., Lima, Ohio, have been authorized by the federal court at Toledo to sell the plant to the Westinghouse Electric Mfg. Co. Representatives of the Consolidated Motors Corp., Lima, made a bid of $750,000 for the property in May, 1934, but failed to buy.

Electrification Topic Of Westinghouse Forum

Use of Motors and Controls Shown To Machine Tool Engineers

EAST PITTSBURGH, PA.—Over 50 machine tool engineers and other interested visitors attended the four-day forum on machine tool electrification conducted by the Westinghouse Electric & Mfg. Co., June 22-25. In addition to a series of lectures and discussions on modern methods of applying motors and control equipment those in attendance had an opportunity to visit the Westinghouse Research Laboratories and to learn from L. W. Chubb, director of research, of the developments there.

Visitors were welcomed to the sessions by Dr. S. M. Kitner, vice-president in charge of engineering. Application of gearmotors to machine tools was explained by R. S. Marthens, manager of the Gearing Division. A tour of inspection of the East Pittsburgh Works was included in the program.

ADDS RESEARCHERS

A division of research associates has been established by Battelle Memorial Institute, Columbus, Ohio, to supplement the research work of the regular staff in fundamental science, and to offer intensive training in practical research.

Exports of Machinery During May, 1936

	May 1936	April 1936	May 1935
Electrical machinery and apparatus	$8,426,528	$7,882,068	$6,331,748
Power generating machinery (except automotive and electric)	679,873	672,139	678,790
Construction and conveying machinery	1,109,277	870,409	576,609
Mining, well and pumping machinery	2,755,177	3,113,017	2,271,456
Power-driven, metal-working machinery	2,959,866	4,600,454	2,307,783
Other metal working machinery	430,319	449,552	208,570
Textile machinery	705,401	884,785	559,726

Exports of Metal-Working Machinery During May, 1936

	May 1936	April 1936	May 1935
Engine lathes	$112,060	$407,113	$236,955
Turret lathes	89,399	95,303	62,431
Other lathes	166,548	71,075	92,163
Vertical boring mills and chucking machines	100,561	108,681	67,356
Thread cutting and automatic screw machines	167,329	147,397	85,419
Knee and column type milling machines	25,743	116,232	41,376
Other milling machines	105,293	115,836	108,336
Gear cutting machines	24,017	163,651	153,457
Vertical drilling machines	34,104	35,161	70,392
Radial drilling machines	1,717	11,376	7,155
Other drilling machines	51,400	167,756	70,553
Planers and shapers	23,802	45,525	48,127
Surface grinding machines	43,113	78,578	60,763
External cylindrical grinding machines	42,023	111,336	60,191
Internal grinding machines	43,186	101,625	102,884
Tool grinding, cutter grinding, and universal grinding machines	109,476	89,107	140,297
Other metal grinding machines	106,365	76,031	83,137
Sheet and plate metal working machines	399,003	1,150,112	98,766
Forging machinery	118,751	232,665	174,212
Rolling mill machinery	723,294	881,987	203,022
Foundry and molding equipment	94,615	83,868	69,279
Other power driven metal-working machinery and parts	378,067	310,039	271,512
Other Metal-Working Machinery			
Pneumatic portable tools	89,811	91,523	46,667
Other portable and hand or foot operated metal-working machines and parts	97,894	71,237	47,002
Chucks for machine tools	24,863	17,753	10,916
Machine operated pipe and thread cutters, stocks, dies, taps and other machine-operated cutting tools	157,418	196,297	49,304
Other metal-working machine tools	60,333	72,742	54,681

U. S. Chamber Adopts Recovery Program

Studies Aimed to Aid Formulating National Policies Is Voted

A ten-point recovery plan, aimed to help formulate national policies to contribute to economic recovery and increased employment, was adopted June 22 by the Chamber of Commerce of the United States, Washington, D. C.

Studies will be made of the following phases of federal functions:

Reduction of public expenditures; government competition with private business; social security; state compacts; employment; monetary policies; tariff treatment of agricultural products; prices in distribution; merchant marine legislation and government reorganization.

Reorganization of governmental agencies are now being studied by three groups. One is working at the request of the President, another is a Senate investigation and a third by a committee appointed by the Speaker of the House.

ROLLS ROYCE PLANT

Sale of Springfield, Mass., Factory Scheduled for August 1

Springfield Manufacturing Co., Springfield, Mass., and Long Island City, N. Y., will be liquidated through a sale of all assets as ordered by Federal Judge Henry W. Goddard. John S. Inskip, president, will submit a bid for the purchase of both plants. Victor M. Tyler, trustee, will continue to operate the service and maintenance departments. The company was formerly the Rolls Royce Corp. of America, Inc. The sale is scheduled to take place August 1.

CLARK TO EXPAND

Increase in business booked for three new products by Clark Equipment Co., Chicago, has made it necessary to enlarge its plant facilities, Eugene B. Clark, president, said.

The three products which "have arrived at the stage where there is good promise of successful commercial development," according to Mr. Clark, are the improved type of automobile truck housing which the company has evolved, the new huck rivet, important to the automobile industry, and an improved truck for railway vehicles.

TO ADD SMALL PLANT

Ford Motor Co. has bought a factory site in Milford, Mich., and is reported planning to erect a small parts manufacturing plant there. It will be another one of Ford's series of small factories located in southern Michigan.

Refrigerator Output Reaches New Records

All-Time High in May Established With 34% Gain

Domestic sales of household refrigerators in May set an all-time high at 299,518 units, against 222,588 in May, 1935, an increase of 76,930, or 34 per cent. Volume in May, 1934, was 233,509. Foreign sales were 320,137 units, against 237,609 in May last year, and 244,178 in May, 1934.

Domestic sales for the first five months reached the record total of 1,095,812 units, against 858,993 the like 1935 period and 683,398 in the first five months of 1934. The five months' record marked the first time in history that the million figure has been attained so early in the year.

INSTITUTE ELECTS

Management Group Names C. M. Bigelow As Chairman of Board

Carle M. Bigelow, Calco Chemical Co., Bound Brook, N. J., has been elected chairman of the executive board and president of the Institute of Management. Dr. Lillian M. Gilbreth and Dr. C. S. Yoakum were elected vice-chairmen of the board and vice-presidents of the Institute. James O. McKinsey, Chairman, Marshall Field & Co., Chicago, and chairman of the American Management Association; Earl Beck; W. J. Donald and Dr. R. S. Quinby were added to the board.

PLANT REOPENS

Remington noiseless typewriter plant of Remington Rand, Inc., at Middletown, Conn., has reopened, offering reemployment to more than 900, James H. Rand, Jr., president, announced. The plant has been closed for four weeks due to a sympathetic strike.

Industrial Review

• MACHINERY MAKERS face a combination of seasonal slackness and political uncertainty that is likely to modify the normal need for replacement during July and August. Should a swing toward Landon set in it would no doubt create a feeling of confidence that would be materially expressed in an increase in orders. Otherwise, resumption of the upswing is likely to be put off until September. June reports showed many localities maintaining recent levels while others have already felt a slight falling off.

• NEW ENGLAND found June business good, even better than May. Price increases contributed to the best month since 1929 in the New York district. Business here is on a high level with no evidence of summer dullness. Both orders and inquiries are holding up well in Philadelphia with no sign of hesitancy as yet. Buyers there were apparently not discouraged by the jubilance of convention delegates.

• PITTSBURGH, too, finds activity satisfactory, with inquiries and orders for individual machines in fair volume. Good business is anticipated throughout the summer despite John Lewis's efforts to unionize the steel mills. Domestic orders have fallen off in Cincinnati, a condition somewhat offset by a good volume of foreign sales. Prospects are for a quiet summer but with volume much above that of last year. Employers are sincerely hoping that labor troubles will not spread.

• CLEVELAND finds business only fair although one or two concerns have noticed an increase in the past ten days. The *Plain Dealer* carries a number of large ads offering work for skilled men. Prospects continue bright in Toledo with current orders good and no interruption as yet in sight. A downward movement, discernible in Detroit, is expected to last through August. Tool shops are enjoying a healthy business, however.

• CHICAGO reports a static condition with orders in abeyance but slow to be released. Good skilled labor is also a problem here. Price increases aided June sales, but July and August are expected to show some recession. Shortage of experienced men has delayed Milwaukee deliveries, but orders continue to arrive in good volume. Indianapolis expects business to maintain a normal summer level. On the Pacific Coast business, while highly competitive, reflects a definite undercurrent of confidence.

Westinghouse Tools Plant For Air Conditioning Unit

Spends $500,000 to Equip Plant for Making Compressors

EAST SPRINGFIELD, MASS. — Approximately $500,000 is being spent in equipping the Westinghouse plant at East Springfield, Mass., to build the hermetically sealed compressors recently introduced by this company for air conditioning service. In order to secure the advantages of reasonably high production and still produce units with capacities ranging from 7 to 22 tons, the new line is designed to have as many parts as possible interchangeable, such as pistons, rods, bearings, valves and head.

A feature of the shop set-up is the air conditioned assembly room which is kept dust free by having it under a slight pressure to prevent infiltration of air from other departments. Thus the sealed compressor is left free from all dirt. Larger units are tested for loading by means of a steam calorimeter which measures the condensate. Smaller units are loaded by means of an electric calorimeter.

In addition to its sealed-in design the new compressors have water cooled motors, harmonically balanced crankshafts and forced lubrication. They are much lower in weight than previous units of the same capacities.

NEW VALVE PLANT

A valve manufacturing plant, to cost $1,000,000, will be built in Los Angeles by Timken-Detroit Axle Co., Detroit. The company contemplates building an axle factory there also.

Cylinder heads, finely finished on a P&W surface grinder, are typical of the careful workmanship going into the new Westinghouse air conditioning compressor

Cleveland Twist Drill Founded 60 Years Ago

Anniversary Celebrated June 27 By Pioneer Tool Company

The Cleveland Twist Drill Co., Cleveland, celebrated its 60th anniversary on June 27. Organized in 1876 by J. D. Cox and C. C. Newton, the partnership had only one lathe and one milling machine, and employed one man. By 1879, the organization occupied a three-story building and was manufacturing a general line of milling machines, planers and twist drills and reamers.

In 1880, Mr. Newton sold his interest to F. F. Prentiss, now chairman.

A pioneer in welfare work, the company inaugurated a profit-sharing plan in 1915. Since then it has paid out more than $2,100,000.

During its 60 years the company has pioneered in metallurgical research.

SHOW REQUESTS DUE

Tool and Parts Manufacturers Asked to Make Applications

Manufacturers of automobile shop tools, machinery, parts and accessories planning to exhibit their products at the National Automobile Show, Nov. 11 to 18, Grand Central Palace, New York, have been asked to apply to the Automobile Manufacturers Association, 366 Madison Ave., New York, not later than July 6, in order to participate in the drawing for space.

ANTHONY HONORED

Hartford Chamber of Commerce Elects Veeder-Root President

Graham H. Anthony, president of the Veeder-Root Inc., Hartford, Conn., has been elected president of the Hartford County Manufacturers Association to succeed Lucius Rossiter, president-treasurer, Terry Steam Turbine Co.

VOTES TO JOIN A. F. of L.

Twenty-six locals of the independent Automotive Industrial Workers Association have voted to amalgamate with the American Federation of Labor's affiliate, United Automobile Workers.

REYNOLDS EXPANDS

Reynolds Spring Co., Jackson, Mich., is building an addition to its spring manufacturing plant to increase output by 50 per cent. New products, recently developed, have crowded present facilities.

Motors AND OTHER MATTERS

Vigorous demand amazes Detroit ... Manufacturers worried about labor ... Ford rumors rife ... Buick to spend $1,500,000 ... 1937 dies eliminate waves in sheet ... Chrysler buying tools, but most is placed

BURNHAM FINNEY
Western Editor

DETROIT — Car makers have been pleasantly surprised by the resurgence of retail sales during June, the vigorous demand necessitating hasty additions to production schedules of 1936 models. June will at least tie May in retail deliveries and may surpass it. The outlook is bright for July, what with bonus money being poured into the market and the stamina shown by industry in general as the usually dull midsummer season approaches.

Optimism is being given free rein by the motor car people who visualize a second half of the year almost as good as the first half. In 1935 over 46 per cent of the year's passenger car sales were made in the last six months.

October Set for New Models

Automobile companies do not intend to rush 1937 cars onto the market early in the fall. July assemblies, entirely devoted to current models, will be relatively high, with some companies knocking off for tooling up purposes at the end of the month. Other makers won't wind up operations until the middle of August or later. It will be close to October 1 before manufacture of 1937 cars starts in earnest, with public announcements set for the latter half of October and early November.

While it isn't being talked about, the labor situation has the automotive brass hats a bit worried. A love feast has taken the place of squabbles in union ranks. The United Automobile Workers Union has absorbed all 26 of the locals of the Automotive Industrial Workers Union (sometimes referred to as Father Coughlin's union), the Hudson local which broke away from the A. F. of L. about two years ago, and three locals of the Mechanics Educational Society. Homer Martin, president of the U.A.W.U., claims a membership of 60,000. His administration is committed to a more militant policy than was Francis Dillon's. It is supported strongly by John L. Lewis and his committee on industrial organization. Certain executives feel that the union will make demands early in the fall, try to tie up production at a strategic time if they are not granted.

What Ford intends to do remains the chief topic locally. However, there are no authoritative reports from Dearborn to indicate what procedure will be followed to regain the leadership which Chevrolet indisputably holds. Ford has just bought steel for the final 40,000 units of its 1936 series.

Chevrolet will rely on a revamped engine, snappy lines and aggressive merchandising to maintain its No. 1 position in the industry. Pontiac is expected to have a six and eight which lean toward the Zephyr type of styling without being so radical. The silver streak grille will be retained, although narrowed. Almost all 1937 cars will have roomier bodies, part of the running boards being sacrificed to permit wider seats.

Automatic Transmission Plant

Buick is building a new transmission plant which will have a capacity of 70,000 units a month. It has not completed purchases of equipment for production of its new automatic transmission which, it is understood, will be standard equipment on the Oldsmobile eight and on the higher-price Buicks and optional equipment on the Oldsmobile six and on Buicks in the lower price range. Buick is said to be buying around 800 machine tools and other equipment costing several million dollars for this job. At the same time it is spending $1,500,000 for new factory buildings which will provide 400,000 sq. ft. of floor space.

The automatic transmission is understood to be the invention of a Detroit engineer who also designed the synchromesh transmission used by General Motors. It is vacuum-operated, with four forward speeds, the fourth or top gear acting in much the fashion of the so-called "over-drive."

Fender draws next year won't be any more severe than this year; in fact, improvement in die design will make them less troublesome. One company has been making its front fenders in one piece with a draw 19 inches deep. The 19-gage steel has been elongated over 46 per cent, the result being waves in the steel which are pounded out at considerable cost.

Dies for 1937 have been so designed that the draw is just as deep but the waves are eliminated. Buick is to have ready a radiator shell stamped in two parts and welded together, according to reports, as a substitute for the present one-piece shell. Zinc die cast grilles will again be popular. Grilles are costly affairs, since they are merely ornamental and contribute nothing to a car's performance, but the public likes them.

The trend toward synthetic enamels for automobile finishes has disturbed the peace of mind of companies which did not want to spend $250,000 to $500,000 to change over their equipment from lacquer. Ford started the synthetic enamel vogue, and Plymouth and Dodge truck took it up. Other Chrysler divisions were getting ready to go to it, but were called off pending further investigations.

Hope for Hupp Reopening

Hupmobile is said to have considered a plan for building Stout's Scarab car at its local plant, but gave up the idea because it couldn't afford to take a chance on the public's acceptance of this rear-engine job. Hupmobile, however, is hopeful of reopening in a few months, producing 1937 models.

Chrysler in the last week has made further purchases of presses for its new heavy stamping department at its Wyoming plant in Detroit. A prominent car company, reported contemplating production of a small car to sell below current prices, has begun the manufacture of a small engine. It has bought only a limited amount of equipment for this job and some of the tooling is described as temporary. Most machine tool buying programs for the start of 1937 production have been completed, giving the equipment trade a breathing spell during which it will try to catch up somewhat on deliveries.

General Motors executives held their annual pow-wow at White Sulphur Springs the past week.

Mechanical Engineers Attend Texas Centennial at Dallas

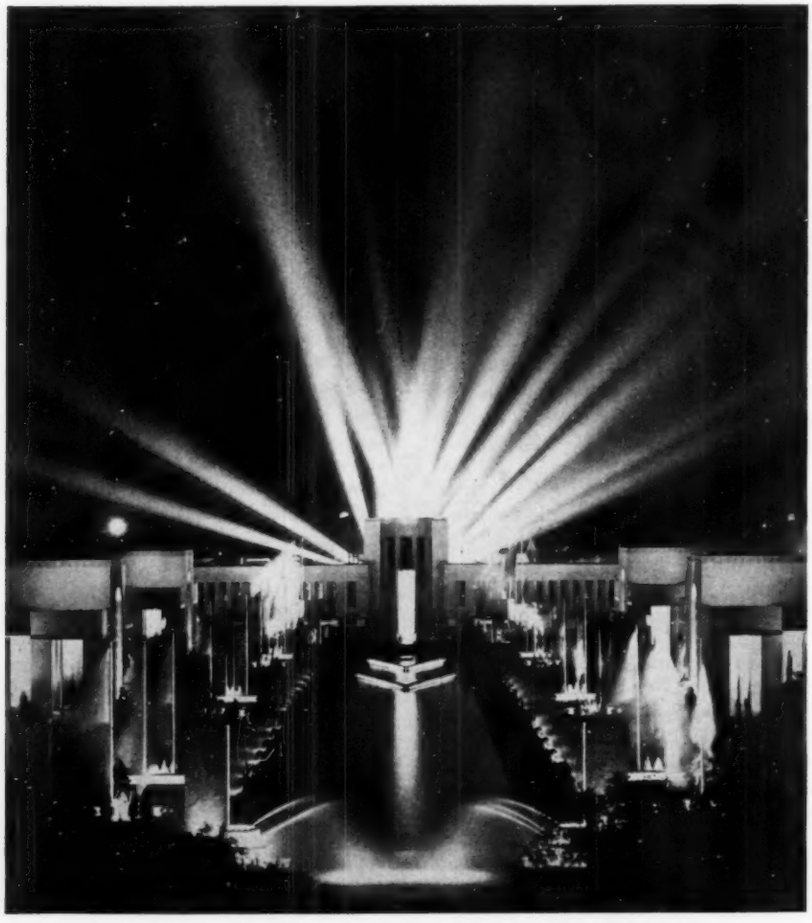
Tornebohm lecture features program crowded with papers, most of them by non-members . . . Northern visitors enjoy exposition and adapt themselves to heat as well as possible

From the point of view of men in the metal-working industries the feature of the technical program of the Semi-Annual Meeting of the American Society of Mechanical Engineers was the paper on gaging and surface quality measurement by Dr. Hilding Tornebohm, chief engineer, SKF (Sweden). This paper was published almost in full in the last issue of *American Machinist*, and is referred to editorially in this one.

Approximately 300 members and guests registered at the Hotel Adolphus in Dallas which was headquarters for the meeting, June 15-20. Most of them came from Texas and neighboring states but a few hardy Easterners braved the Texas June sun and stood it as best they could.

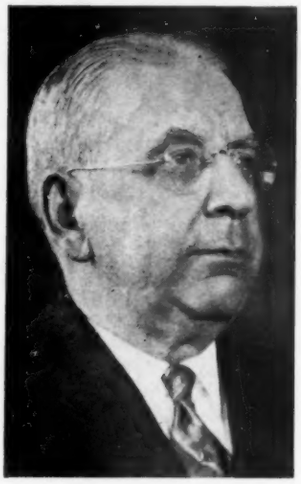
The main reason for staging a meeting in Dallas was in the opening of the Texas Centennial in Dallas. Modeled after the Chicago Century of Progress this Texas show is more compact and the lighting effects are better worked out. It is essentially an evening show because the heat and glare of summer in Dallas are rather trying to "foreigners."

To men in the machine trades the Ford exhibit has the most to offer. It is better arranged than the Chicago Ford exhibit but not so comprehensive. A novel feature is the arrangement by which lecturers can plug in at any point along the line and get radio amplification for their descriptions of the processes shown.



Dallas Centennial, scene of the Semi-Annual Meeting of the American Society of Mechanical Engineers, June 15-20

Nominated for President



JAMES H. HERRON

General Motors has a beautiful mission-type building housing a display of its products. Chrysler Corporation makes striking use of dark blue glass for the walls and ceiling of its space in the transportation building. General Electric has its House of Magic and a display of products, as has Westinghouse. A. T. and T. and Western Union have displays patterned after those at Chicago.

Several of the Chicago concessions are again in evidence, notably Streets of Paris and Streets of the World, each of which boasts an "apple" dancer. The apples are raw.

Because there were so many papers on the program simultaneous sessions were necessary, to the annoyance of some members who found conflicts in their schedules. Nearly 30 of the papers were by non-members, a fact which created some comment, although it did not detract from the value of the papers.

Nominations Announced

The nominating committee held open sessions during the meeting, and after long discussion presented the following slate for officers to be voted on by letter ballot:

For president, J. H. Herron, President, James H. Herron Co., Cleveland, at present a vice-president of the Society.

For vice-presidents, J. A. Hall, professor of mechanical engineering Brown University, Providence, R. I., and consulting engineer of Brown & Sharpe Mfg. Co.; J. M. Todd, consulting engineer, New Orleans, and R. J. S.

For Vice-President

J. A. HALL

Two of Three A.S.M.E. Manager Nominees

KENNETH H. CONDIT

SAMUEL W. DUDLEY

Pigott, staff engineer in charge of engineering, Gulf Research & Development Corp., Pittsburgh.

For managers, E. W. Burbank, Allis Chalmers Mfg. Co., Dallas; K. H. Condit, editor *American Machinist*, McGraw-Hill Publishing Co., New York, and S. W. Dudley, dean of engineering, Yale University, New Haven,

At the Council meeting it was decided to hold the next semi-annual meeting at Detroit on a date to be decided.

Will Spend $1,500,000 On Buick Plant Layout

General Motors Division to Redesign Manufacturing Layout

Buick Motor Co., Flint, Mich., has begun an expansion program at cost of $1,500,000 which will substantially redesign its manufacturing layout and add 400,000 sq. ft. of floor space. A new transmission plant, with capacity of 70,000 transmissions monthly, will be built. It will be of monitor-type, one story in the main section, 138 x 1,027 ft. A new building will house equipment for heat treating transmission parts. Manufacture of service parts will be moved into the present transmission building.

A three-story building, 220 x 240 ft., will be the home of the master mechanics division, works engineering division, personnel department, metallurgical and standards division, branch office of purchasing department and factory police department.

A new building for the heat treating of gears and axles will be constructed.

Industrial Employment Shows 5% Gain in Month

National Industrial Conference Board Finds Payrolls Are Up

Manufacturing activity in the 25 industries combined in the studies of the National Industrial Conference Board increased nearly five per cent during the twelve months from April, 1935, to April, 1936, as compared with the preceding twelve-month period.

Total man hours worked during April of this year were nearly three per cent higher than in March, 1936, and payrolls were up 3.2 per cent during the month.

Declines in employment in textile, leather and boot and shoe industries were offset by increases in steel, metalworking and allied industries.

As compared with April, 1929, the April, 1936, data show 15.4 per cent fewer workers were employed; manhours worked were 32.7 per cent less; and combined payrolls were down about 30 per cent, the Board found.

SPENDING $600,000

McKinnon, G. M. Subsidiary, Announces Expansion of Manufacturing Plant

McKinnon Industries, St. Catharines, Ont., parts manufacturing subsidiary of General Motors of Canada, Ltd., is beginning a rehabilitation program which will cost $600,000, exclusive of any new equipment purchased.

Construction work includes a new power house for furnishing steam for heating and processing work and generating compressed air and the housing of electrical distributing apparatus, and a new manufacturing building.

Governor On S.A.E. Aero Production Committee

Merriam of California Joins Aircraft Leaders

Governor Frank F. Merriam of California has joined with a group of the most distinguished aeronautical leaders in the country to act as an advisory committee for the National Aircraft Production meeting of the Society of Automotive Engineers which will be held at the Ambassador Hotel, Los Angeles, October 15 to 17. Mayor Frank L. Shaw of Los Angeles will also serve, John A. C. Warner, S.A.E. secretary and general manager, said.

The gathering will be the first ever held dealing specifically with aircraft manufacturing problems by any organization, and will record the progress of the airplane industry from a preponderance of hand work toward mass production methods. Air transportation and maintenance problems also will be discussed.

The general committee for the meeting will be headed by Carleton Edward Stryker, chief engineer, Curtiss-Wright Technical Institute of Glendale, Calif.

INLAND EXPANDING

The Inland Mfg. Co., Dayton, Ohio, division of General Motors Corp., is expending $750,000 to add 175,000 sq.ft. of floor space for increased production facilities. About $150,000 is being spent on new equipment.

$150,000 EXPANSION

Toledo Machinery Firm Annuonces Big Modernization Program

S. M. Jones Co., Toledo, oil field machinery and supply manufacturer, will spend $150,000 for new machinery, tools and buildings, the company announced.

Rather to replace obsolete manufacturing equipment than because of increased business is the reason for the program, Percy C. Jones, president, said. Only a small part of the plan involves new building construction.

This program is the eleventh large modernization undertaking announced in the Toledo area during the first five months of the year.

TO WIDEN FIELD

Lockheed Aircraft Plans Adding Line of Military Airplanes

Lockheed Aircraft Corp., New York, is planning to enter the military aircraft field, Robert E. Gross, president, told stockholders at a recent meeting. Present orders, he said, would keep the company's plant working at capacity.

U. S. ORDERS PLANES

Seventy-seven single-seater pursuit airplanes have been ordered by the War Department from Seversky Aircraft Corp., Farmingdale, L. I., to cost $1,636,250. They will be all-metal construction, powered by Pratt & Whitney double-row radial engines.

MEETINGS

AMERICAN SOCIETY FOR TESTING MATERIALS. 39th Annual Meeting, June 29–July 3, Atlantic City, N. J. C. L. Warwick, Secretary-Treasurer, 260 South Broad St., Philadelphia.

DAIRY & ICE CREAM MACHINERY MANUFACTURERS ASSOCIATION. Oct. 12–17, Atlantic City, N. J. Roberts Everett, vice-president, 232 Madison Ave., New York.

GREAT LAKES EXPOSITION, July, August and September, Cleveland. Lincoln G. Dickey, manager, Terminal Tower, Cleveland.

NATIONAL METAL SHOW. 18th Annual Exposition. Oct. 19–23, Lakeside Exposition Hall, Cleveland. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY COUNCIL, INC. 25th Congress and Exposition, Oct. 5–9, Atlantic City, N. J.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC., Aircraft Production Meeting, October 15, 16 and 17, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 West 39th St., New York.

OBITUARIES

ELIHU H. CUTLER, 80, one-time president of the Knox Automobile Co. and president of the Association of Licensed Automobile Manufacturers, died June 21. Earlier in his career, he founded the Electron Mfg. Co., later absorbed by Otis Elevator Co.

JOHN N. DERSHUG, president, Easy Washing Machine Co., Syracuse, N. Y., died June 2.

CHARLES HENRY EDWARDS, 65, for years works manager and later general manager of C. Parde Works, Perth Amboy, N. J., machinery manufacturers, died June 15.

WILLIAM P. GREASON, 71, retired superintendent of the Carnegie-Illinois Steel Co. Gary Ind., works, died June 14 in Chicago. One-time shop machine foreman and later works master mechanic of the Joliet, Ill., works of the Illinois Steel Co., he was the superintendent of the huge Gary plant construction project in 1906.

ABEL S. GOMEZ, 50, superintendent of the Quincy Adams Yacht Yard, Quincy, Mass., died June 18.

ROBERT JARDINE, 58, chief engineer of Wilcox-Rich Corp., automotive valves and parts manufacturer, died June 12. One of the pioneers in the automobile manufacturing industry, he served as chief engineer of a French car maker in 1899. He was responsible for many manufacturing improvements and developed numerous metal-working methods.

AUGUST W. KRAUSE, 70, since 1922 president of Western Hardware Mfg. Co., Milwaukee, shop tools and specialty maker, died June 11.

JOHN W. MACMORRIS, 57, since last July factory manager of Chance Vought Corp., East Hartford, Conn., died June 10. For 10 years he had been factory manager of the Skayef plant, Hartford, and at one time was factory manager of Norma-Hoffmann Bearing Co.

CHARLES D. POTTER, 62, who founded C. D. Potter & Co., hardware manufacturers, in 1905, at Stamford, Conn., died June 21.

JOHN F. PRICE, 74, executive vice-president, Trundle Engineering Co., Cleveland, died June 7. He joined Brown Hoisting Machinery Corp. in 1906 remaining until 1922 when he joined Trundle. He was nationally known for his work in solving manufacturing and management problems in a number of industries.

MILLARD J. ROBERTS, 40, general manager, Timken-Detroit Axle Co., Windsor, Ont., plant, died June 16 following an automobile accident.

MARSHALL R. SCOTT, 50, president, Barlow & Seelig, Ripon, Wis., washing machine maker, died June 11.

LIEUT. COMMANDER GUY D. TOWNSEND, 41, assistant plant superintendent, Naval Aircraft Factory, Philadelphia Navy Yard, died June 21.

EXPORT OPPORTUNITIES

Agricultural tools and implements. (Agency.) Quito, Ecuador. *985.

Airplanes, spare parts, engines. (Agency.) Melbourne, Australia. *988.

Air-conditioning and refrigeration equipment. (Purchase.) London, England. *961.

Button-making machinery. (Purchase.) Valdivia, Chile. *984.

Crown cap making machinery. (Purchase.) Madrid, Spain. *983.

Glass paper manufacturing machinery. (Purchase.) Cairo, Egypt. *980.

Latex manufacturing machinery; dippers, vulcanizers, calenders. (Purchase.) Kaunas, Lithuania. *968.

Lathes, metal-working, screw-cutting, bench type. (Agency or purchase.) The Hague, Netherlands. *1017.

Oil mill machinery for producing flaxseed and copra oils. (Purchase.) Novi Vrbas, Yugoslavia. *996.

Piston pumps for concrete; spray guns for liquid cement. (Purchase.) Madrid, Spain. *983.

Railway supplies. (Agency.) Quito, Ecuador. *985.

Welding equipment. (Purchase.) Haarlem, Netherlands. *965.

Wheels, rail-car; shovels. (Agency.) Bogota, Colombia. *995.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington or any district or cooperative office. Please refer to key number.

American Machinist REFERENCE BOOK SHEET ©

Shop Operations on Zinc Die Castings

Because die-cast parts are produced in quantity, it is important to know the machining characteristics of the zinc alloys when finishing certain surfaces or holes, and also the behavior of the alloys in riveting, forming and welding

Ordinarily, machining of zinc alloy die castings is not necessary because of the dimensional accuracy achieved in the casting process, but at times it is required for some special purpose. Information received from men experienced in this field, and reproduced through the courtesy of the New Jersey Zinc Company, indicates that high-speed steel tools are satisfactory for most lathe and boring operations. Cemented carbide has been justified on high-production jobs or where extreme accuracy is required. A sharp tool is necessary, the cutting angle being from 62-69 deg., the top rake from 15 to 20 deg. and the front clearance from 6 to 8 deg. although occasionally up to 20 deg. may be necessary for high-speed operations.

Chips Are Bothersome

Milling cutters, reamers and similar tools produce the best results when they are of the coarse-tooth helical design with appreciable top and side rake. Two-fluted helical-fluted taps with ground and relieved threads provide ample chip clearance and rapid chip removal and are therefore satisfactory on zinc alloy. Crowding of taps can be avoided if the holes are die cast slightly larger than the usual standard practice for other metals. The smoothest external threads are obtained by hobbing or by chasing after threading.

Drills of the two-fluted design with helix angles about double the usual 24 deg. are satisfactory. Carbon tool steel drills may be used on most work, but for the larger diameters the high-speed steel drills are sometimes desirable. In cases of deep drilling or rapid operation a polished flute helps to prevent clogging with chips. The included angle of the cutting edges may be reduced advantageously and the clearance angle should be 15 deg. at the periphery of the drill and gradually increased still further as the drill point is approached. Beveling off the end of the flute back of each cutting edge provides more chip clearance for rapid work. Recommendations for a coolant are as follows: (1) three parts mineral oil, two parts kerosene, or (2) a fuel oil of the type known as "32-36 furnace oil." Removal of coolant, particularly kerosene, is difficult prior to plating, and the amount should be minimized.

Riveting and Forming

Assembly of parts by riveting is often facilitated by casting the rivet body as a part of the die casting. Similarly, thin flanges are often cast which may be spun over other parts of the assembly. If the die casting must be bent or formed into the desired shape after production, three considerations must be kept in mind:

1. Some of the zinc die-casting alloys lose part of their ductility through aging and therefore the choice must be made from alloys which maintain their ductility.

2. Zinc alloys reach greatest ductility at moderately elevated temperatures so that heating prior to riveting or spinning may be desirable. Temperatures up to 212 F. may be used. Therefore boiling water is a convenient heating medium. Ductility of the metals falls off sharply below room temperature (70 F.), and satisfactory results cannot be obtained.

3. Certain of the die-casting alloys do not possess sufficient ductility to facilitate assembly. A short aging at 212 F. will probably produce sufficient improvement.

Better success is achieved in welding zinc alloy die castings by employing a reducing flame and a rod of similar material. Very specialized technique is required and, even at the best, entirely satisfactory results are not obtained. On the other hand satisfactory soldering of the zinc alloy die castings can be done by the use of a zinc-cadmium eutectic as a soldering material. This eutectic has a composition of 82.5 per cent cadmium—17.5 per cent zinc with a melting point of 508 F. Surfaces to be soldered should be ground or sandpapered to remove oxide film. The solder is then applied without flux by means of an iron, and a slight rubbing action is necessary to insure perfect wetting. The eutectic has a tensile strength as cast of about 22,000 lb. per sq.in. Soldered joints having at least half this strength can be produced.

Plating Before Soldering

As an alternative method the ordinary lead-tin mixtures may be used, providing the die casting is first coated with electro-deposited nickel. In this case the use of acidulated zinc chloride as a flux is suggested.

The cadmium-zinc and the lead-tin solders decrease the life of any casting on which they are used. There is sufficient diffusion between the casting and the solder to produce a zone of inferior resistance to intergranular attack. A further hazard is the possibility of contamination resulting from the return of soldered castings to the melting pot.

A number of tests were performed to determine the effect of cold swaging on the properties and stability of zinc alloy die casting materials, which revealed the following:

1. Until 40 per cent reduction in area, cold swaging improves the tensile strength and the ductility.

2. Cold swaging does not make the alloys sensitive to intergranular attack.

. . . there must be a lot of gravy in one of those ice boxes to count up to $10,000,000 in six months

IF THE WORKER ONLY KNEW—

Would he think industrial profits too high?

SAM and Big Bill, the planer hand, walked slowly home on a sultry summer's afternoon. When they reached Bill's gate, the big fellow suggested that Sam join him in a glass of cold beer.

"There's nothing I'd like more," said Sam, turning into Bill's doorway.

"Isn't that a new electric refrigerator you've got there?" asked Sam as he slaked his thirst. "When did you get it?"

"Only last week, Sam. Isn't it a peach? There's plenty of room in it, and it freezes 80 cubes of ice."

"It keeps the beer nice and cold all right; but I noticed in the paper last week where the company that makes it had a profit of $10,000,000 in the first half of the year. That's a pile of money to squeeze out of poor chaps like you and me."

"It's a big company, Sam, and I guess it's entitled to a fair profit like anyone else."

"A fair profit, yes. But there must be a lot of gravy in one of those ice boxes to count up to $10,000,000 in six months."

"They turn out lots of other products, Sam—all kinds of domestic appliances and lots of commercial electrical equipment as well."

"Just because they're big is no reason for gouging us little fellows so they can pay big dividends to stockholders who already have more money than they need."

"I've got a few shares of their stock myself, Sam, and I need the money as much as the next one. I'm mighty glad they can pay a dividend."

"You're an exception, Bill. Most workmen don't own any stock. By and large it's all in the hands of the wealthy financiers and investors."

"That's where you're wrong, Sam. According to the company's statement they have over 300,000 stockholders, and the average holding is less than 40 shares. That doesn't sound like they're a bunch of bloated plutocrats."

"Well, Bill, I see you know more about that particular company than I do. But from what I've heard about these big corporations that's a mighty unusual condition."

"You've heard a lot of hearsay, Sam, that isn't borne out by the facts. If you'd look it up you'd find that stock of most large corporations is widely distributed. The majority of shareholders are men of small or medium incomes who put their dividends back into circulation just like I did for this refrigerator."

"That's just a coincidence, Bill. How about the man who doesn't own any shares? He still gets soaked for part of that ten million and doesn't get anything back."

"Well, doesn't he? If this corporation wasn't big it couldn't have afforded the years of research that went in to develop a successful machine. If it didn't have a good surplus it could never have stood a loss for three years and still kept going. If it didn't make a profit it couldn't buy the new equipment that has cut the price of this refrigerator one-third in the past two years. You see, Sam, a consumer does get a break after all."

"How about the small manufacturer? It seems to me that he gets squeezed out when these big outfits start to battle for business."

"Yes, that's true where mass production is involved. Certain kinds of manufacture call for a big investment and can only be handled efficiently by a big concern. But where specialized service is required small and medium sized companies still do very well."

"I hadn't thought of it in that way, Bill, but I guess there is a lot in what you say. Somehow these corporate profits in the millions always seemed unreasonable to me."

"They do to a lot of people who don't stop to think through on the subject. Profits are the life blood of industry, Sam. Restrict them and you curtail development and reduce employment."

"I'm convinced, Bill. Say, how much did that box set you back? I'd like to get one like it."

Reprints of this article in pamphlet form, suitable for distribution in pay envelopes, can be secured at relatively small cost

Ideas FROM PRACTICAL MEN

Quick-Acting Double Vise

F. SCRIBER

A quick-acting, cam-operated double vise for holding two similar castings while being milled is shown in Fig. 1. The vise has detachable jaws so that it can be adapted to hold other work.

The work, indicated by heavy dotted lines, is milled by the two gangs of cutters *A* and *B* which are of opposite hands, since the two pieces are held in reverse position on locating pins in the overhanging ends of the fixed jaws. As the vise is double, a description of the operating members of one of the halves will be sufficient.

The work is located by placing it on pins *C* and *D* which engage holes in the ends. The movable jaw *F* is mounted on the slide *H* and is operated by the cam *I*, which is integral with the lever *K*. When the cam is rotated clockwise it presses against a hardened plate on the block *L* and draws jaw *F* into contact with the work, clamping it securely against the fixed jaw *M*. The shape of the cam is such that it quickly advances jaw *F* to the work and then holds it securely against the fixed jaw *M*. In addition, the spring pin *N* can be released against the work and then locked by the screw *O* to provide additional support to the outer end of the work against the cutting thrust.

While the operating members on each half of the vise are identical, those of one half are mounted directly on the base, and those of the other half are mounted on the angular block *P*, which is supported by a wedge and is attached to the base by four screws passing through elongated clearance holes in the wedge, thus making an adjustable unit. To understand the construction of this adjustable feature, reference is made to Fig. 2, in which the base of the vise is shown at *A;* the wedge at *B;* while *C* indicates the block

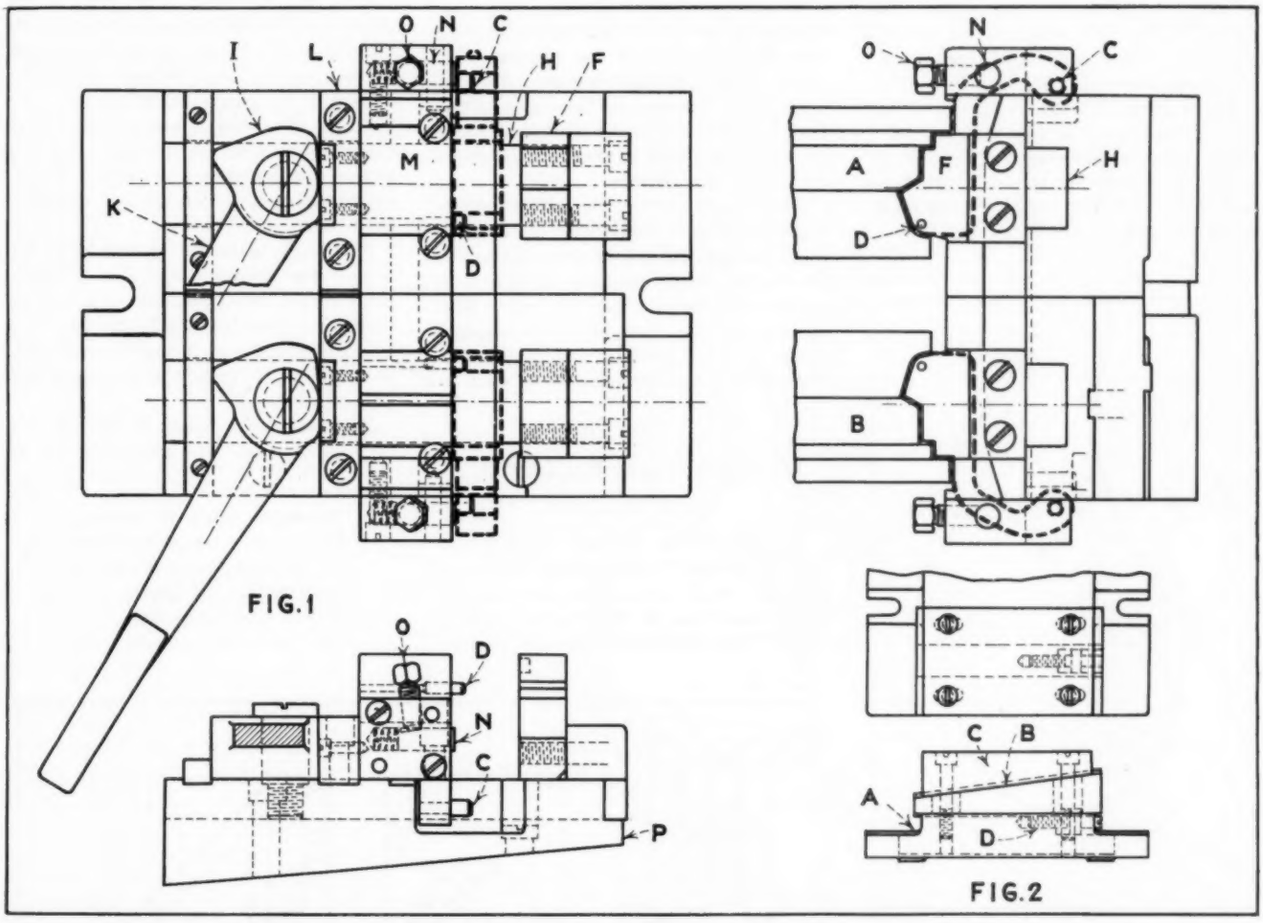


Fig. 1—Two similar castings are held in this cam-operated double vise. One-half of the vise is adjustable for height to compensate for any variation in diameter in the two gangs of cutters. Fig. 2—Details of the adjustable feature. Traversing the wedge by the adjusting screw will raise or lower the block on which the operating members are mounted

on which the operating members are mounted. A collar on the adjusting screw *D* engages a groove in the underside of the wedge, the body of the screw being threaded in the base. By turning the screw in or out, the wedge can be traversed in either direction. Traversing the wedge raises or lowers the operating members mounted on block *C*, and consequently the work, to compensate for any difference in diameter of the two gangs of cutters.

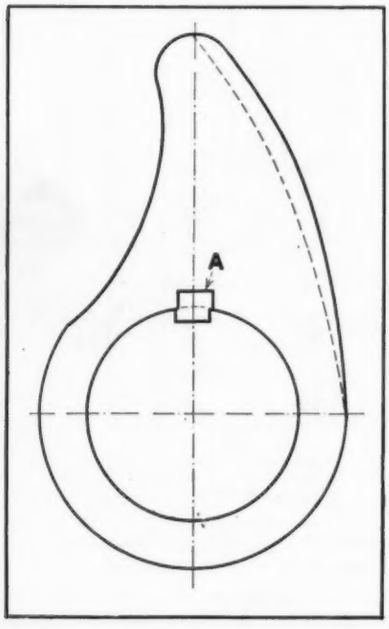
Offset Keys

PAUL ERICSON

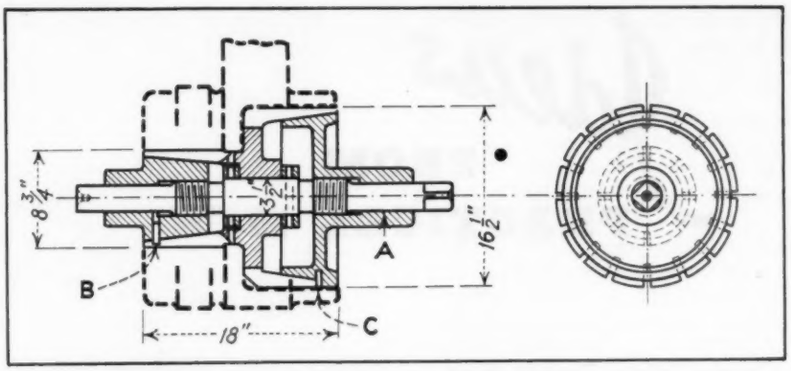
When cams or other actuating parts of automatic machines become worn so that the machines do not function properly, the trouble can often be remedied by using offset keys to set the parts ahead to compensate for the wear.

In the illustration is shown a toe cam that has been worn as indicated by the dotted lines. The offset key at *A*, properly made and applied, has brought the cam back to its normal position, permitting the machine to function correctly.

Of course, if the wear is great enough to require a key with so much offset as to weaken it, the keyway in either the shaft or the cam must be widened and a key wider at that point must be used.



Offset keys can often be used to bring worn actuating members of automatic machines back to normal position to compensate for wear



Large and heavy work having a bore of two diameters can be easily mounted on a two-step expansion mandrel such as the one illustrated

Two-Step Expansion Mandrel for Large Work

J. R. WHITTLES

The expansion mandrel illustrated has two steps on which to mount large work having a bore of two diameters. The taper plugs for expanding the sleeves are drawn toward each other by the right- and left-hand screw *A*, collars being provided to prevent the screw from moving endwise. Pins *B* and *C* are inserted in the taper plugs through the slits in the sleeves to keep them in line and prevent them from turning in the sleeves.

The larger sleeve has sixteen slits, eight from each end, while the smaller one has eight slits, four from each end. The expansion sleeves are in one piece and extend from a central web. The sleeves and the taper plugs are castings made from a mixture having 60 per cent of iron and 40 per cent of steel.

Complete Sine Bar Outfit

IRA S. WILLIAMS

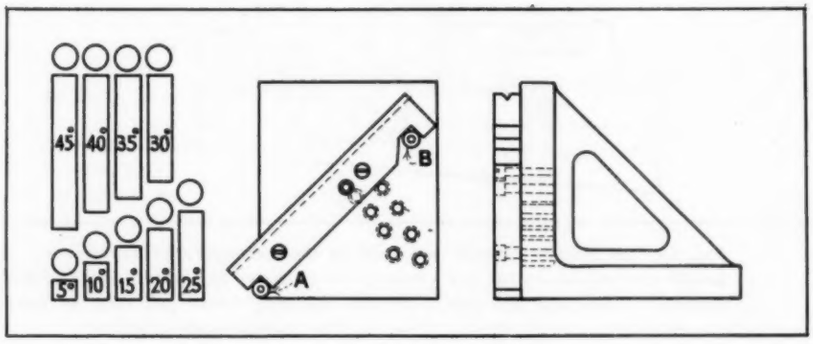
Possibilities in the use of the sine bar for accurate setting and checking angular work are often overlooked. Sometimes this is due to the awe in which the average mechanic regards the device, or to the lack of suitable accessories.

To overcome such difficulties, the outfit illustrated was devised. The disks are attached to the bar by screws passing through their diameters in such direction that the disks will contact both surfaces of the notches machined in the bar. This method of mounting the disks makes for ease in making the bar, as any error between the centers of the disks can readily be corrected by grinding the sides of the notches. The disks are of the same thickness as that of the bar, and the top of the bar has a V-groove to accommodate shafts and other cylindrical work.

The angle plate has tapped holes for screws for clamping the bar in positions corresponding to any of the commonly used angles, the bodies and the heads of the screws being loose enough in the bar to permit adjustment for accurate settings.

The end gages shown at the left are of lengths that will readily make it

The angle plate with its tapped holes and a set of end gages for setting the sine bar to commonly used angles make useful accessories for setting and checking angular work

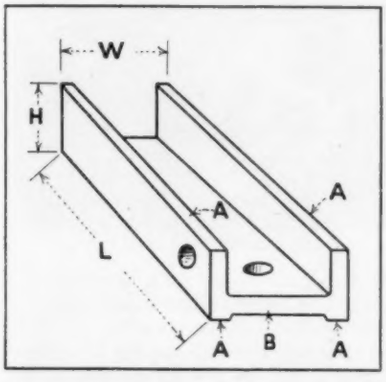


possible to set the bar to any of the commonly used angles. Settings for other angles can be made by the use of gage blocks. With disk *A* resting on the surface plate, an end gage of the correct length is placed under the disk *B* and the bar is clamped by the screws. In setting the bar to angles for which tapped holes in the angle plate have not been provided, it can be held by a clamp.

A Drill Press Parallel

D. A. ROGERS
Dayton Rogers Manufacturing Company

Common channel iron lends itself very well to making parallels for the average drill press. The sketch shows how a piece of channel iron has been machined on the four surfaces *A* and relieved on surface *B*. The parallels may be made in various widths, lengths and heights as shown by dimensions *H*, *L* and *W*. For a small drill press a parallel 6 in. long by 2 in. wide is practicable, and for larger machines we have built them up to 12 in. in length by 5 in. wide by 3 in. high. In a number of cases it has been found practical to carbonize and harden the parallels and to grind the surfaces *A* parallel.

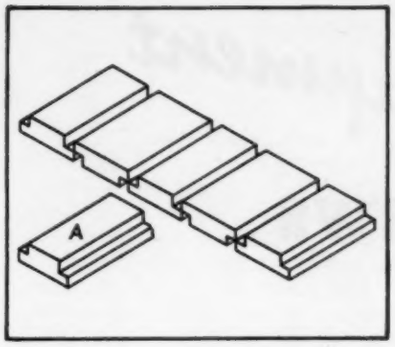


The two holes are provided for hanging up the parallel or chaining it to the drill press

Another Use for Cotter Pins

STANLEY BALDWIN

The lowly cotter pin affords a cheap but effective means for attaching a chain or a spring to mechanism where a swivel effect is desired. By passing the shank through a hole in the part to which the chain or spring is to be attached and spreading and clinching the ends at right angles and then striking the eye to loosen the shank in the hole, the eye will form a swivel ring.



By cutting grooves in each side of the bar to the center, as shown, there was no waste of material in cutting

Saving Material

J. E. MOORE

We had to make five rabbeted pieces of tool steel like the one shown at *A*. The bar from which they were to be cut was barely long enough without allowing for the kerfs in cutting.

However, one of our students worked out a scheme that got the job done. In one side of the bar he cut grooves alternating in distance and to the center of the thickness of the bar. Then he turned the bar over and cut offset grooves in that side, the outer corners of which met those of the first grooves at the center of the bar, as shown in the illustration. Thus the five rabbeted pieces were produced without more waste of material than would have been necessary for the rabbeting alone.

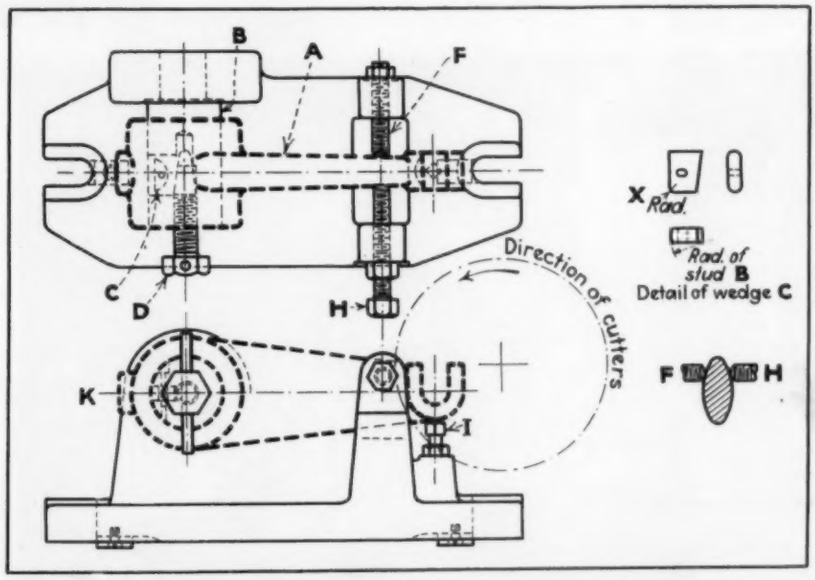
Fixture for Milling a Lever

PHIL. E. VERAA

The fixture illustrated was designed for holding the lever *A* for straddle milling the end boss and milling a slot therein. The hub on the opposite end is bored and reamed and is mounted on the stud *B*, which has a clearance of 0.005 to 0.010 in. in the hole to allow quick mounting.

To insure that the lever will be held at a right angle to the stud, the wedge *C*, fitting a slot in the stud is forced outward by the taper portion of screw *D*. The lever is slipped on the stud until arrested by contact with the stop screw *F*. Screw *D* is then tightened and its taper portion moves the wedge to the left and draws the lever back, bringing the right-hand side of the wall of the hole tightly against the stud. The lever is then securely locked by tightening screw *H* and forcing the work against the end of screw *F*. These screws contact the web of the lever in such a way that its outer end is forced downward against the head of the stop screw *I*, as shown in the view at the lower right.

The wedge is retained in its slot by the flatted pin *K* to prevent it from falling out when the fixture is not in use. It is important that the wedge be well rounded at *X* to prevent it from scoring the hole in the hub as the lever is slipped on the stud. After straddle milling the boss, the arbor carrying the cutters is removed and a finger mill for milling the slot is inserted in the spindle of the milling machine.



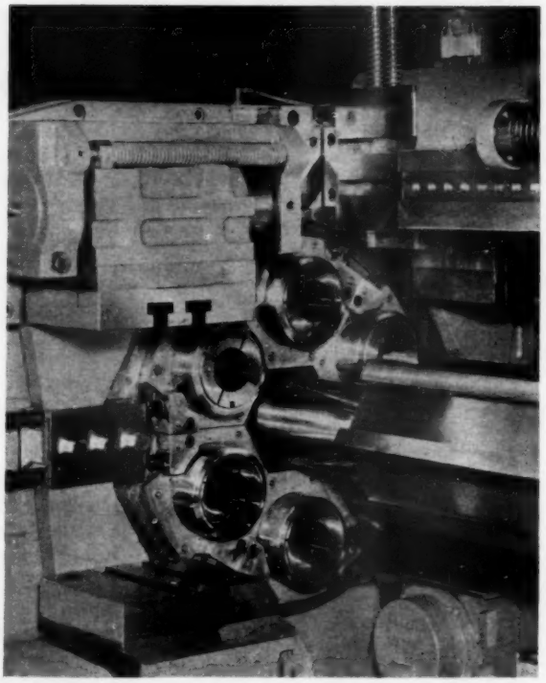
Mounted on a free fitting stud, the lever is held tightly at a right angle to the stud by a wedge operated by the tapered portion of a screw

Shop Equipment NEWS

New Britain Models 61 and 42 Automatic Screw Machines

In a new line of automatic screw machines, the New Britain Gridley Co., New Britain, Conn., retains the design improvements developed in its Models 40, 41 and 60, recently announced, and includes further features for retaining built-in accuracy and increasing output. Model 61 consists of three six-spindle sizes, 1⅝, 2 and 2¼ in., while Model 42 consists of two four-spindle sizes, namely 2⅝ and 3 in. bar capacity. Both models are built on the same frame, the difference being in the spindle carrier and the main tool slide which is hexagonal for the six-spindle sizes and square for the four-spindle sizes. Thus the new models make available for larger sizes of bar stock the same type of machine that has already proved successful in the smaller models.

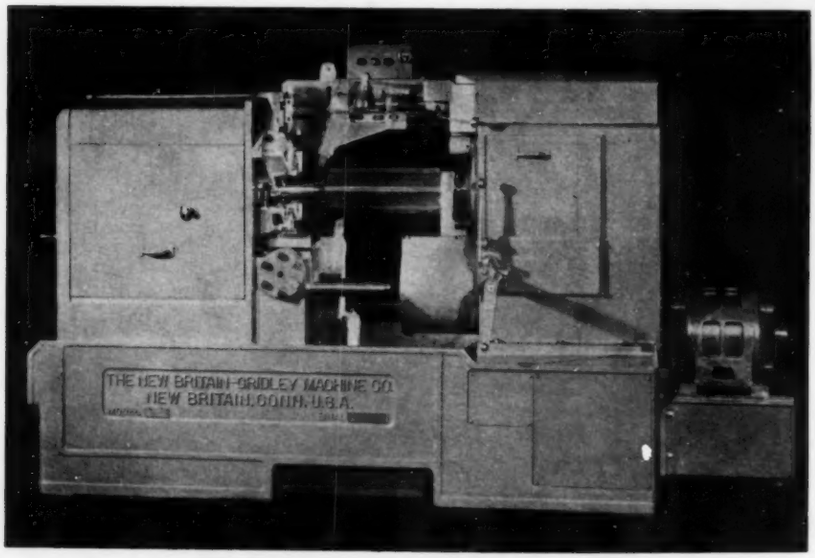
Freedom from wear of the spindle carrier is insured by lifting it from its seat during indexing and automatically clamping it securely during the cut. The carrier is fitted with preloaded ball-bearing spindle mountings and has hardened and ground locking-bolt slots. The spindles are short to eliminate deflection, and their mounting in extra large preloaded "Radax" type bearings reduces to a minimum all radial and axial deflection under maximum tool pressures.



Spindles are mounted on preloaded ball bearings in the extra large diameter carrier

The smooth straight-line appearance of these machines is attained without sacrificing accessibility. For instance, the cam for operating the main tool slide is entirely inclosed and out of the way of chips or dirt, yet is readily reached for changing. Cams are all jig-drilled to insure interchangeability and rapid changeover.

Three main forming slides are mounted on cylindrical hardened and ground steel studs, supports for which are cast integral with the base and headstock of the machine. The face of each slide, adjacent to the headstock, is guided in its cross travel between two hardened and ground ways. The cut-off slide and the optional No. 5 position forming slide on the six-spindle model, are of flat gibbed construction with hardened and ground steel ways.



New Britain Gridley's Model 61 has six end-tool positions and five cross-slides; the same frame is used for the four-spindle Model 42

Where it is desirable to use such tools as reamers and taps with motion independent of the main tool slide, these can be used in positions Nos. 4, 5 or 6. Tools in any two of these positions can be operated independently of each other and a third tool can obtain an independent motion in conjunction with one of the other two.

Large sliding panels at the front and rear of the machine make all parts of the power box readily accessible for inspection and adjustment. This mechanism, together with all the rest of the machine is automatically lubricated with a circulating pressure and splash system supplying filtered oil.

One of the many features that have been incorporated for the operator's convenience is an automatic electric stop built into the machine through which the cycle is halted in the loading position with the collet open when the stock is exhausted in any spindle. The device is so arranged that when a butt end of the stock is left the machine will complete the last full piece before stopping. At the same time a signal light warns the operator that the machine needs attention. The stop is also semi-automatic in operation, permitting of making one cycle of the machine and then stopping with the slide withdrawn to facilitate checking the work and adjusting the tools.

The carrier is indexed through a modified Geneva motion which operates smoothly at high speeds to reduce the time of indexing. The same mechanism is used for both six-spindle and four-spindle machines by the substitution of one set of gears for another which changes the indexing from a quarter turn to a sixth turn. As developed on earlier models, the collet-operating mechanism consists of hardened and ground outer and inner sleeves which actuated by the chucking shoes give axial movement to the tubes. Chucking pressure is distributed over thirteen large diameter hardened rolls which permit of maximum chucking pressure with minimum power and insure a balanced chuck-operating mechanism. Chuck-operating forks are equipped with a trigger release which allows opening the collet in any position.

Colmonoy Crystals Applied With Furnace Heat

Colmonoy Co., Los Nietos, Calif., has perfected a method of applying its "Sweat-On" crystals with furnace heat, thus eliminating the expense of either the carbon arc or the oxyacetylene flame. Colmonoy Sweat-On consists of a mixture of chromium boride crystals and a metallic boride. This crystalline mixture, when applied to steel or cast iron, forms a non-oxidizing wear-resistant, corrosion resistant skin.

The furnace process consists in covering the surface to be treated with a thin layer of the crystals dampened with 3 parts of water and 1 part sodium silicate to form a paste. This is allowed to air dry thoroughly and then is brought up to approximately 2,250 F. in a non-oxydizing atmosphere. If this type of atmosphere is not convenient, it is possible to accomplish the same results by dusting the surface of the paste-covered metal with a thin coating of boric oxide flux.

Fellows "Red Liner" for Hourglass Worms

The Fellows Gear Shaper Co., Springfield, Vt., recently placed on the market a new type of "Red Liner" for checking hourglass steering worms. The equipment indicates the amount of clearance between the worm and sector or roller with index lines for each quarter revolution of the worm. This machine operates on the same fundamental principles as the regular "Red Liner" used for checking external and internal gears, but with the exception that it is intended for hand operation only. It is arranged with a

Fig. 1—Front view of Fellows "Red Liner" designed for checking hourglass steering worm

40 to 1 magnification for English and 50 to 1 for metric measure.

A ball-point plunger held in the carrier is brought in contact with both sides of the worm thread, and this sets the carrier in the correct position for both angle and center distance. A light bulb in the cabinet facilitates making this setting and inspecting the location

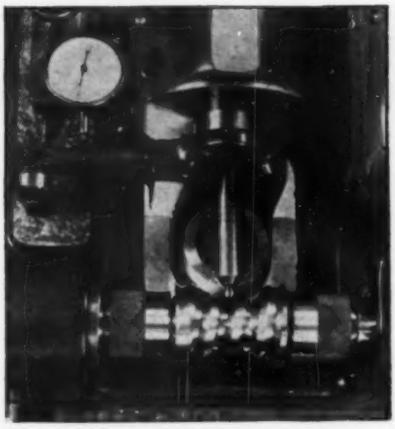


Fig. 2—Close-up showing arrangement for setting master roller or sector carrier at the correct center distance and thread angle

of contact of the worm and sector teeth or roller. Two size blocks are employed: one as shown to set the carrier at the correct angle, and another located at the rear of the machine to set the carrier at the correct center distance.

The chart made on this machine indicates the amount of clearance between the worm and master roller or sector for each quarter revolution of the worm. The clearance between the worm and sector increases rapidly after the worm makes one complete revolution so the roller or sector will not bind or cramp in the worm at the end.

In operation the sector or roller holder is set to the correct center distance and angular position by size blocks, as shown in Fig. 2, and when a master sector is employed the graduated dial is set at zero.

In checking the worm it is necessary to start either at one end of the worm or at the other, depending upon the direction of the helix. The sector holder carrying the master roller or sector is elevated and moved to the end of the worm, then lowered to engage the worm, and the crank handle on the graduated dial rotated in a clockwise direction until the roller reaches the opposite end of the worm.

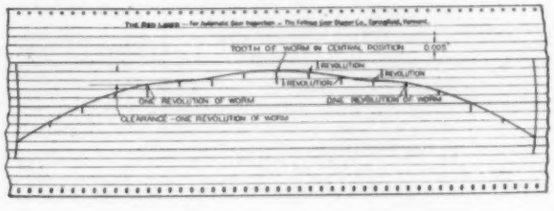


Fig. 3 — Representative "Red Liner" chart for checking the hourglass steering worms

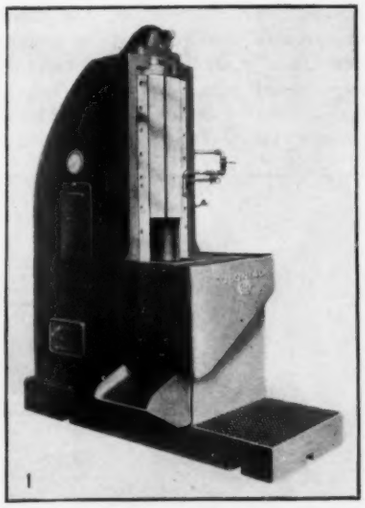
Colonial Broaching Machines

A complete line of standard broaching machines and equipment, comprising eleven basic types in 49 different models, has been announced by Colonial Broach Company, Detroit. The line is designed to provide popular-priced standard machinery to cover practically the entire field of broaching, eliminating the necessity for most special designs. Of course, Colonial will continue to design and supply special machines where unusual requirements do not permit the use of standard machinery.

The machines can be changed over easily from one size to another in the event of production changes. This has been made possible by designing and producing the machines on a unit basis comprising respectively the base, column, and table. Another feature of the line is the attention given to progressive line production broaching. It is possible to mount several single-ram broaching machines on a single base with continuous feed fixtures.

The entire line of machines makes use of welded steel and cast-iron construction. All units are operated through individual motor drives and all have extra-large coolant tanks and pumps. Chips do not accumulate around the work or tool, but drop down into large containers, which are easily removed for cleaning. In all cases ways are made of hardened and ground steel; rams are of semi-steel and exceptionally rigid. All machines are operated through hydraulic pumps, arranged for high cutting speeds and fast returns. In a number of cases variable-speed controls are standard equipment. In most cases automatic lubrication is provided, the control imparting a shot to the ways at every cycle.

The two lines of vertical surface broaching machines represent developments from and an expansion of the line of Colonial single- and dual-ram types (Figs. 1 and 2). They incorporate, however, a considerable number of improvements and refinements, including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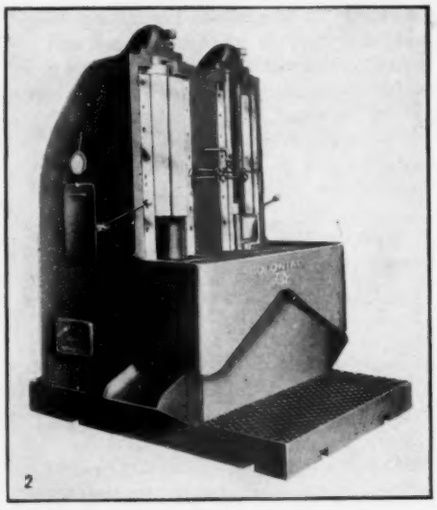
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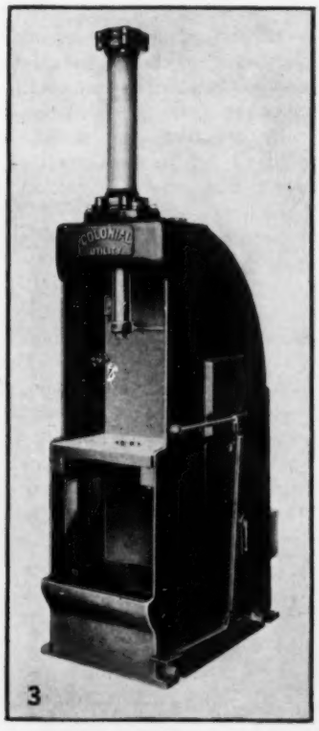
Fig. 1—"Single Ram" surface broaching machine available in eleven sizes from 6 to 25 tons. Fig. 2—"Dual Ram" surface broaching machines carry receding tables



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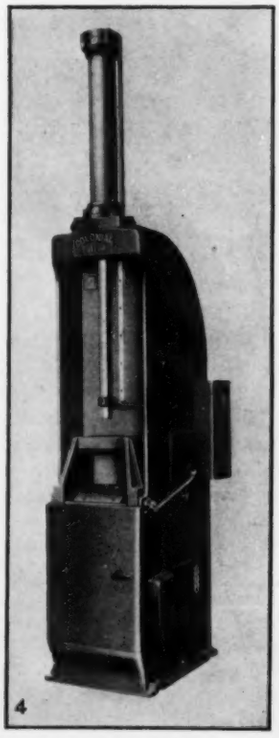
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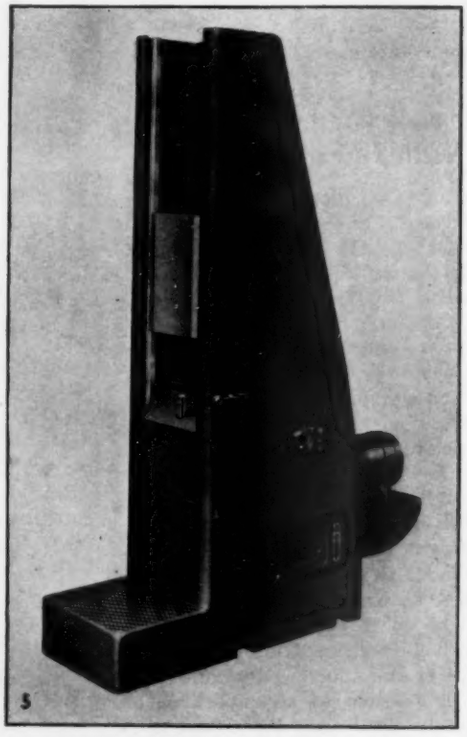
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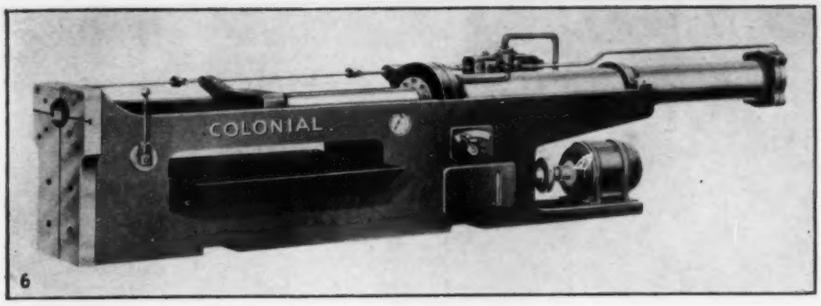
Fig. 3—"Utility" broach now available in seven sizes. Fig. 4—High-speed "Pullup" for fairly light cuts. Fig. 5—The heavy-duty vertical "Pullup" is available in 10, 15 and 20 ton capacities



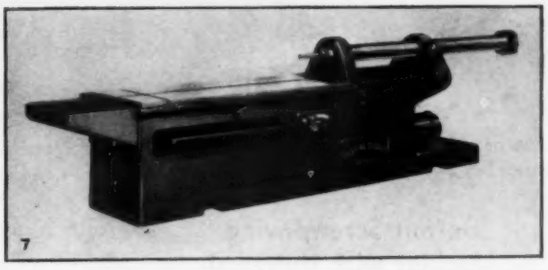


Fig. 6—"Universal" pull-type machine is adaptable to both internal and surface broaching. Fig. 7—"High Speed Pusher" is suited for continuous surface broaching of small parts

greater adaptability to line production, the provision as standard equipment of receding tables for work clearance during the return stroke and while loading, a considerable cleaning up in exteriors and a number of important internal operating improvements. These models are now available in tonnages from 6 to 25 tons and in strokes of 36 to 60 in., and will handle surface broaches having a maximum width of 13½ in. per broach.

The "Utility" broaching line is also a development from a previous series with similar internal improvements (Fig. 3). This line is available in from 6 to 15-tons ram capacity and in strokes of 24 and 36 in.

Another vertical machine designed for internal broaching is the high-speed vertical "Pullup" (VC-1) series, available in three models, ranging from 6 to 15 tons in capacity, with a standard stroke of 36 in. (Fig. 4). These machines are designed for high-speed production of such parts as bushings, the finishing of internal gears — instances where fairly light cuts are to be taken and a high production rate is demanded. They may be used either as single- or twin-broach machines. They are particularly adaptable also to short runs where ability for rapid change-over is essential.

The ram is of the pull type, the machine being equipped with a lower cylinder to handle the broach. Broaching is entirely automatic with this construction, no handling of the tools by the operator being required. Cutting speed is 30 ft. per min. with a 60 ft. per min. return stroke. Drive of the 1,000-lb. pressure hydraulic operating unit is through V-pulleys and belts from a motor mounted in the base. Coolant is supplied both above and below the work and is controlled by the starting handle.

The heavy-duty vertical "Pullup" (VG-1) series is complementary to the VC models, being designed for similar work where heavy-duty broaching is required (Fig. 5). Its application comes in such fields as broaching large gears, long holes, spiral gears and roughing large holes. This type is available in capacities from 10 to 20 tons and in both 48 and 60 in. strokes. In general design the arrangement of these models closely follows the VC series with the exception, of course, that construction is even more rigid. Variable cutting speed control is incorporated in this machine.

Designated as universal pull types the horizontal internal and surface broach (HA-1) series (Fig. 6) comprises six models, available in from 6 to 20 ton capacities and in 48 and 60 in. strokes. This group is particularly adapted to the broaching of keyways and round and splined holes. Faceplate capacity is such that the machines can also accommodate a wide range of surface broaching fixtures with tools up to 10 in. in over-all width. Sturdy follow rests can be supplied to facilitate the handling of extra large broaches.

The standard cutting speed is 30 ft. per min. with a variable-speed control as standard equipment, connected to the hand lever. Return stroke is at the rate of 60 ft. per min. Operation is through a 1,000-lb. hydraulic pump driven by a direct-coupled motor. Control of the ram is through a four-way valve located in line with the hand lever control. Coolant supply starts and stops with the machine.

The high-speed "Pusher" (HB-1) horizontal surface push-type broaching machine is suited for continuous production of small parts, such as are used in washing machines, typewriters, small automobile parts (Fig. 7). Coming in a standard 36-in. stroke this 6-ton model is specially designed for the provision

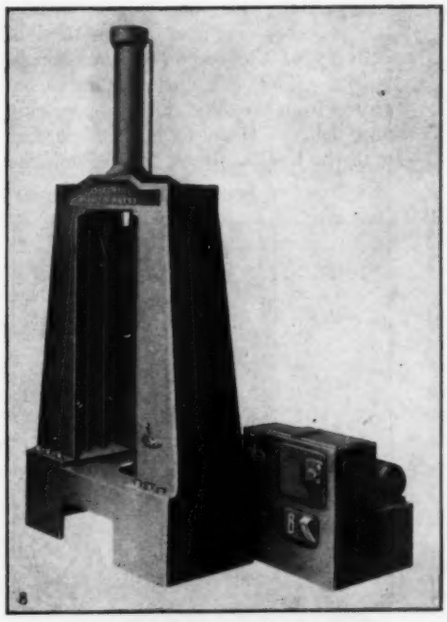


Fig. 8—"Power Presses" are available in a full range of tonnages and strokes. Fig. 9—"Light Duty" presses come in three models of 1, 2 and 4 tons with 18-in. stroke

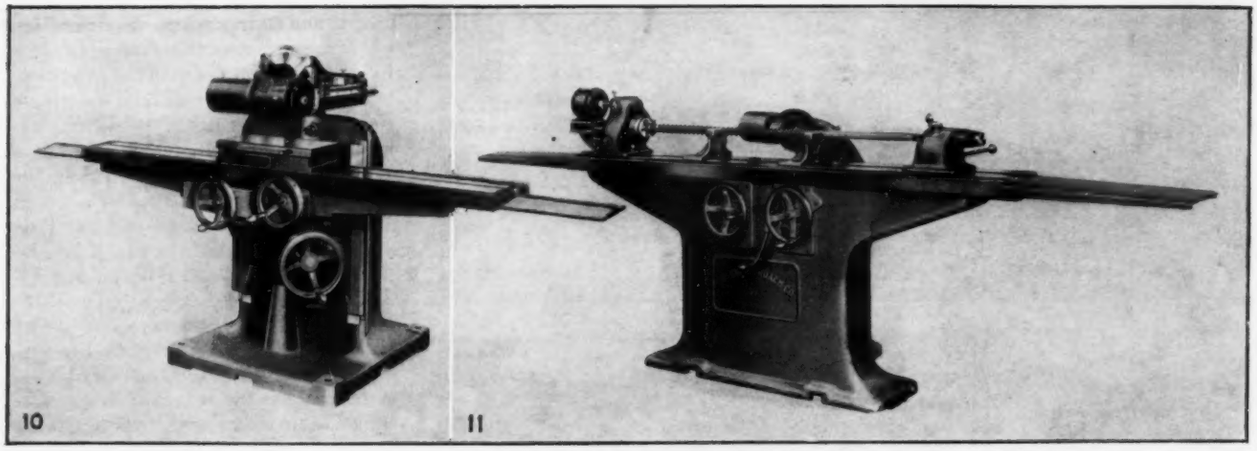


Fig. 10—Surface broaches are sharpened on this compact machine. Fig. 11—In this cylindrical-broach sharpening machine the usual difficulties in grinding under-cuts are said to be overcome

or addition of magazine-feed hoppers. Thus, it makes possible continuous production with a minimum of attention.

For the broaching of large spiral and straight gears and ring gears, and for large surface broaching up to 2 ft. in width, a line of "Power Presses" of the double-column type (VK-1) are provided, available in any capacity (Fig. 8). Length of stroke is easily variable so that virtually any length of stroke can be supplied as standard. Operation of rams is hydraulic, as in all other Colonial types, with an operating pressure of 1,000 lbs. per square inch.

Light-Duty Presses

At the other end of the range, for light shaving with surface type broaches, broaching of small keyways, pressing in all bushings and other assembly work, there is a series of three light-duty presses ranging from 1 to 4 tons in capacity (Fig. 9). All models of this VF-1 series are produced with an 18-in. stroke and are also hydraulically operated.

Included in the Colonial line are two broach sharpeners. These designs are provided with direct-driven spindles. Broach-driving headstocks are driven separately through a two-speed gearbox, eliminating all belts and pulleys. Special attention has been given in the design of these machines to protect them against grinding dust.

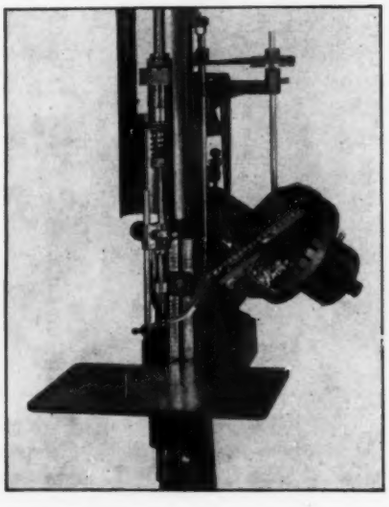
The line comprises Model SFA-36 (Fig. 10) designed for sharpening surface broaches and Model SRA-72 (Fig. 11) for cylindrical broaches. Both types are designed to overcome the difficulties inherent in grinding the under-cut.

The manufacturers claim that a reduction of two-thirds in time required to sharpen broaches is quite common with this type of equipment.

Detroit Screwdriving Machine with Universal Barrel-Type Hopper

The Detroit Power Screwdriver Co., 5365 Rohns Ave., Detroit, Mich., annouces a magazine-feed power screwdriving machine equipped with a universal barrel-type hopper. This design of hopper makes the machine especially adaptable to short-length screws having large-diameter heads. The universal principle permits changing from one size of screw to another, in order to take in the range of a No. 4 to a ¼-in. screw with but two sizes of collector rings.

The hopper is shown with the hopper ring partially cut away in order to show the collector ring and the method of delivery of the screws to the storage tracks. The collector ring picks up screws from the mass in the hopper ring and delivers them to a point in line with the tracks. Here, the inside baffle plate is provided with a screw guide which directs the screw into them. When the storage tracks become full of screws, jamming is prevented at the delivery point by an adjustment of the collector ring whereby the screws are carried past the end of the right-hand track.

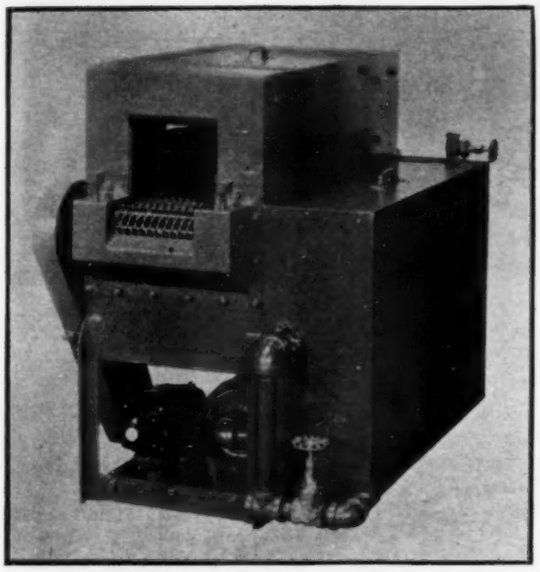


Operation of a foot lever releases a screw from the storage tracks by means of an escapement, delivering the screw to the gripping fingers. These are adjustable to the size of the screw shank, and align the screw with the rotating bit. The spindle travels downward, engages the screw and drives it to any desired tightness by adjustment of the friction clutch. When the screw enters the thread, the gripping fingers release to allow the screw head to pass.

A friction clutch adjustable to any desired tension rotates the bit by drift only as it seeks the screw slot. The clutch is disengaged and the bit has ceased to revolve as it leaves the slot after the screw is driven. The clutch is engaged only during the process of driving the screw. This permits of driving small brass screws at high speed without any possibility of marring the heads.

"Gunk" Degreaser

A self-emulsifying solvent known as "Gunk" is being marketed by The Curran Corporation, 114 Central St., Somerville, Mass., for the degreasing of machinery, automotive motors and chassis and other applications. "Gunk" makes a stable emulsion of oil and greases with cold water. The solution is made up of the material and kerosene or other low-cost solvent. After the oils and greases have been treated they may be removed by hosing with cold water.



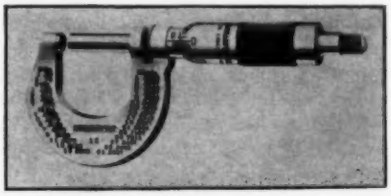
"Metalwash" Midget Washing Machine

To be used primarily in connection with automatic grinders or similar machine tools, and also as an independent small-parts washing machine for either manual or automatic loading, the Metalwash Machinery Co., Inc., 27 Haynes Ave., Newark, N. J., is introducing a midget washing machine. This machine will clean parts as fast as they come from machine and automatically discharge them to tote box or conveyor for routing to the next operation. The washing machine thus becomes an automatic part of the production line.

The chain-belt conveyor is 9 in. wide and has a 6 in. clearance. Conveyor speed can be from 3 to 10 ft. per min., depending upon the requirements of the work. For smaller work, such as screw machine parts, a rotary drum with spiral screw is used instead of the chain belt. Washing compound may be alkali solution or oil slush for rust proofing. Solution can be heated by steam, gas or electricity. Pump and driving mechanism take 1½ hp. Floor space, 3 ft. 10 in. x 3 ft. 9 in.; over-all height, 3 ft. 6 in.

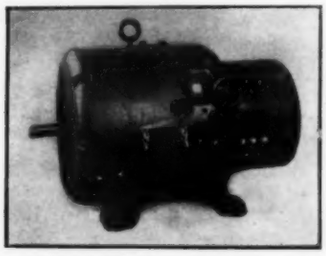
B.&S. Nos. 12 and 13 Micrometer Calipers

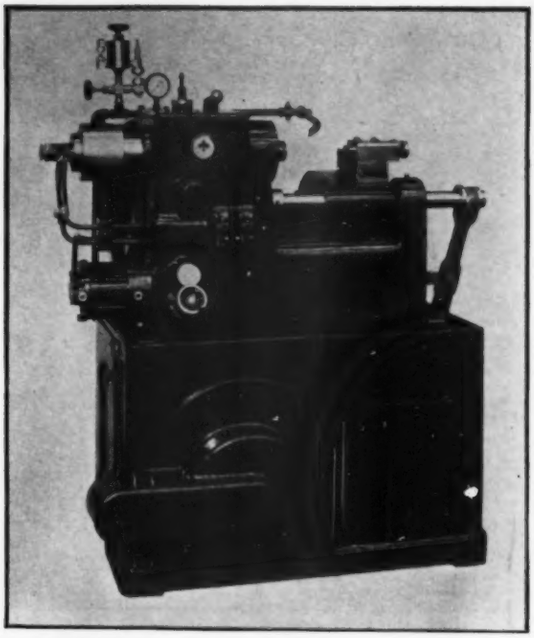
The Brown & Sharpe Mfg. Co., Providence, R. I., has announced a new design for micrometer calipers Nos. 12 and 13. These micrometer calipers combine the utility of the C-type frame with the advantages of the old Nos. 12 and 13 design. The narrow anvil end of the frame allows for measuring deep in slots. The C-type frame permits convenient finger grip and full measuring capacity. Range of the No. 12 is from 0 to 1 in. by thousandths, and of the No. 13 from 0 to 1 in. by ten-thousandths.



Westinghouse Welding Generator

A welding generator for belted or coupled welding sets incorporates a control system producing better arc quality, according to the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This machine uses the "cross-field" principle and the operator can adjust the generator to give the required welding current before the set is started. The control is stepless, permitting minute changes in current adjustment. A polarity reversing switch is provided. Three sizes are available: 200, 300 and 400 amp.





An air cylinder moves the tool slide to and from the working position

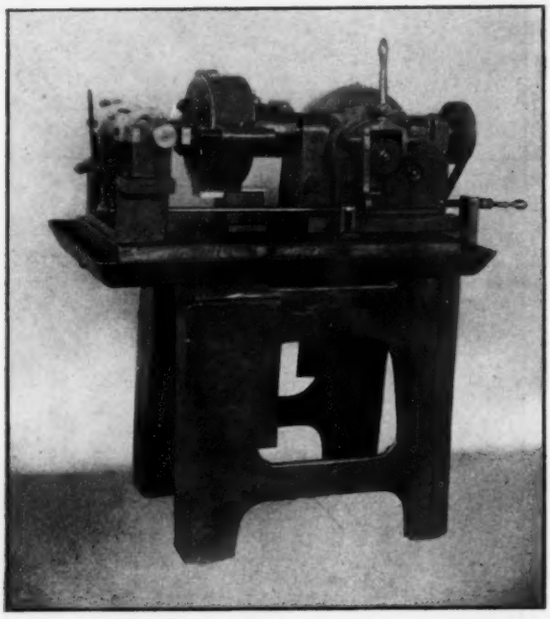
LeBlond 11-In. Lathe for Ball Race Grooves

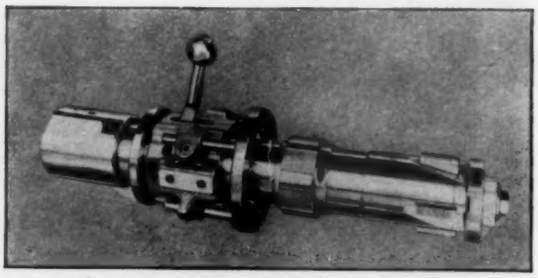
The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, has built a special automatic lathe for turning a grease-retainer groove in the bore of the ball-bearing race. The spindle drive is from a New Departure variable-speed unit, up to the drive pulley by V-belts, through a Pullmore clutch and brake, then through a right-angle worm drive, thus giving infinite speed variations from 100 to 600 r.p.m.

The cross feed drive is taken off the clutch shaft, coarse changes being obtained through pick-off gears and three fine increments through a sliding gear. This arrangement gives feed rates of 0.0015 to 0.010 in. per rev.

The feed is engaged by a tool slide being brought up to the working position through an air cylinder arrangement. The feed cam is carried in the tool arm and engages a clutch in the headstock, giving about ⅛ in. cross feed. When the groove has been turned, the tool slide drops clear of the work, and the cam trips a trigger, reversing the air cylinder to pull the slide into the loading position.

The work is held in an air-operated collet controlled by the small handle at the left. The larger handle is for moving the slide into working position and engaging the feed. The ball handle is an emergency trip for withdrawing the tool arm at any time during the cycle.





Above — Landis tap with pilots is collapsible

Left — Chain bars are drilled on this Langelier machine

Landis Collapsible Tap With Pilots

A collapsible tap with pilots to insure concentricity of the thread being tapped with other parts of the casting is now being marketed by The Landis Machine Co., Waynesboro, Pa. The accompanying illustration shows such pilots applied to a Style LT collapsible tap. The body is of special length to reach to the bottom of a deep hole in a cast-steel tractor part. The pilot ahead of the chasers lines up the tap with the bore of the hole while the rear pilot is made in the form of a collar fitting over the tap body. It fits a reamed hole near the top of the casting with which it is necessary to maintain concentricity. Both pilots are made of steel, hardened and ground, and are made to revolve with the work in order to prevent seizing. Similar pilot arrangements suitable for requirements of practically any type of job can be furnished with Style LT collapsible taps in all sizes from 1⅜ to 12 in.

Langelier Drill for Chain Bars

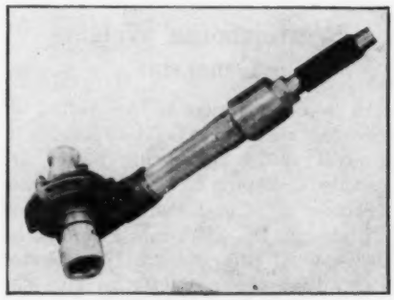
For drilling chain bars the Langelier Manufacturing Co., Providence, R. I., built the special semi-automatic machine illustrated. It consists of a No. 31 automatic motor-driven drilling unit equipped with a multiple-spindle head. It drives 40 ⅛-in. drills spaced on two rows approximately $\frac{7}{32}$ in. apart, the spindles being located on $\frac{11}{32}$ in. centers. A second head is interchangeable in the machine to drive 50 drills with spindles on ⅜ in. centers.

The fixture consists of a drum with grooves to receive the bars. These are indexed to the drilling position and then ejected automatically. A stripper plate carries guide bushings for locating the drills and also serves to hold the piece while in the drilling position. The fixture is indexed automatically from a cam on the main control shaft of the drill unit. Floor space, 3x4 ft.; over-all height, 45 in., and weight, 1,800 lb.

Thor Hamerench

A pneumatic tool that combines the actions of a hammer and a wrench has been introduced by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This No. 603 "Hamerench" applies and removes all types of nuts in locomotive work, structural steel work, shipyards, automobile plants and other industries. Being of the right-angle type and operating horizontally to the application, this machine works in places ordinarily inaccessible. By changing the socket from one end of the spindle to the other, the tool is made reversible.

A ratchet collar receives its motion from the piston in the hardened steel barrel. It in turn actuates the spindle which drives the socket. Speed and power of the blows are controlled by a self-closing throttle. The number of impacts can be as high as 1,800 per min. Specifications: working space with socket, 7 in.; length of spindle without socket, 6⅜ in.; length, 22½ in.; weight 25 lb.; capacity, all nuts up to 1⅛ in. full size.



"Smootharc" D.C. Welding Electrodes

Coated rods for d.c. welding are now being made by the Harnischfeger Corportation, Milwaukee, and include five different types. These have both high and low rates of fluidity for various types of work in welding with flat, vertical or overhead positions and with ferrous and nonferrous metals. Tests show tensile strength of welds from 55,000 to 75,000 lb. per sq.in. with various types of rods ranging from $\frac{1}{32}$ to ⅜ in. in size. Bulletin No. R-1 describes the line.

Westinghouse "De-ion" Linestarters

A complete line of linestarters employing the "De-ion" principle of arc interruption has been announced by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Designed for across-the-line starting for single-phase and polyphase, squirrel-cage induction motors and as primary switches for wound-rotor motors.

Ingersoll Ray-Blade Face Mills

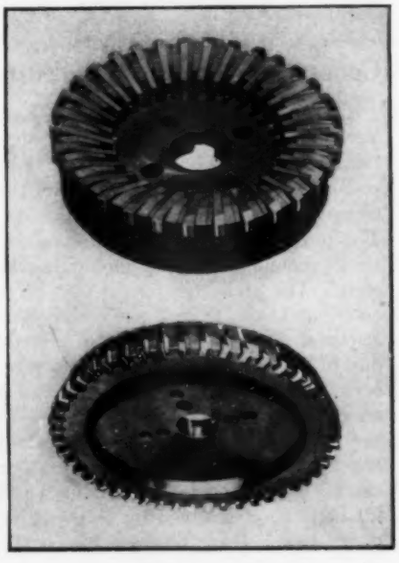
As there is an essential difference between the maintenance of roughing and finishing of face-milling cutters, the Ingersoll Milling Machine Co., Rockford, Ill., has developed the "Ray-Blade" cutter. When roughing, the wear on the cutter blade is mostly on the diameter of the cutter; when finishing, the wear is mostly on the face.

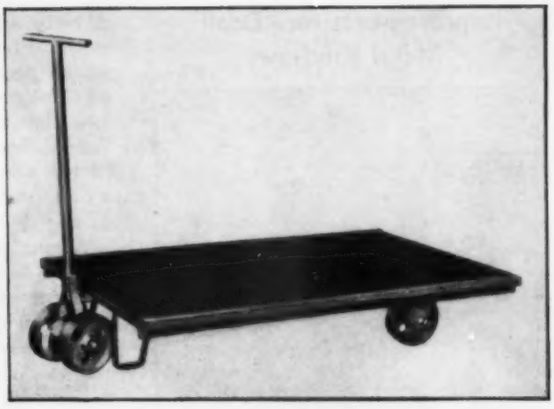
The "Ray-Blade" is a universal face milling cutter blade. It is made to lie along the radial face of roughing cutters or along the conical diameter of finishing cutters. It is radially adjusted to compensate for the diametrical wear in roughing cutters, and axially adjusted in finishing cutters.

The blade is a double-tapered type, being positively locked in the cutter housing with a compensating serrated wedge. It is tapered along the length so that it will not push down or back from the thrust of the cut, and is further dovetail tapered across its width to prevent it from pulling out of the locating slot. Because the serrated wedge is double tapered, the cutter blade can be either moved further along or down the serrated slot, when regrinding becomes necessary. The wedge thus compensates for the thinning movement. Furnished in either high-speed steel or stellite, the Ray-Blade may be used in either right- or left-hand cutters.

The standard Ray-Blade roughing cutter is designed for light or medium cuts, ¼ in. deep or less. The radially adjusted blade gives twice the wear.

"Ray-Blade" universal face milling cutter blade applied to a roughing cutter at the top and a finishing cutter at the bottom





Clark Lift-Jack Unit for Material Handling

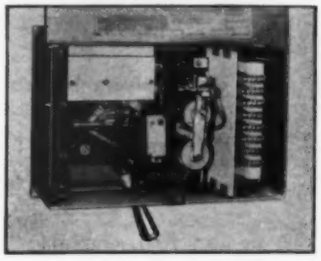
The All Steel Welded Truck Corp., Rockford, Ill., is producing the Clark lift-jack unit for material handling which is used with welded platform skids for movement of materials and parts in plant operations. As shown at the left of the accompanying illustration it consists of a lifting mechanism carried between two wheels, and being attachable and detachable quickly from the welded steel platform. The platform can be approached from right or left angles or head on. Contact is made by bringing the handle forward to the horizontal position. This movement of the handle locks the engaging pin in the socket and at the same time raises the platform approximately ¾ in. from the floor. To disengage is necessary only to trip the foot lever. One man can spot and transport a number of loads using a single jack.

The jack unit has a lifting power of 6,000 lb. and employs a fulcrum lift mechanism. It weighs only 42 lb., and requires only 76 lb. handle pressure to operate. The welded steel platforms offer an inexpensive means of storage for reserve materials, and they are always easily accessible for quick transportation.

Ohio Brass Automatic Motor Starter

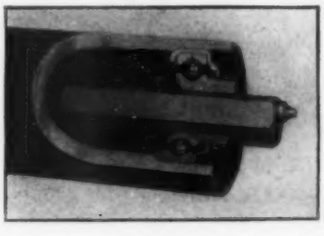
Further simplicity and larger clearances for its parts were secured in the Type DRT automatic d.c. motor starter, recently redesigned by the Ohio Brass Co., Mansfield, Ohio. This starter, one of five models, was designed for automatically starting and protecting shunt- or compound-wound d.c. motors on various types of machinery. An improved resistance element, consisting of one continuous wire wound on an asbestos form, eliminates deterioration and breakdowns.

Overload and short-circuit protection are provided by an automatic circuit breaker, fitted with a thermal element which is set for overloads of 25 per cent for 3 min. Regularly furnished for 250 to 600-volt motors, ranging from 2 to 50 horsepower, but can be supplied in larger sizes.

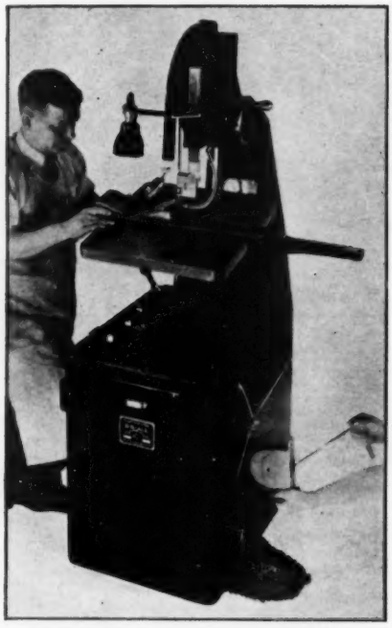


Standard Protected Conveyor Bearings

The Standard Conveyor Co., North St. Paul, Minn., has developed four types of protected bearings for use with gravity conveyors. Under working conditions where injurious dust is present, a bearing has been designed with an inner and outer felt seal. The felt washers make the unit adaptable for use where a greased bearing is required and where any dripping of grease would be objectionable. Another bearing which can easily be flushed and refilled, has a felt washer supported by steel built into the rear. This prevents the grease from working backward during the flushing process. The steel shield in front has a sufficient outlet for the old grease to escape.



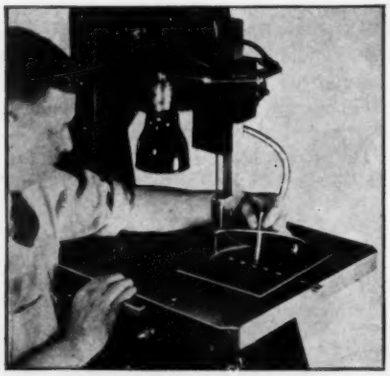
Improvements for "Doall" Metal Bandsaws



A spring motor, shown outside the base in connection with the hands, furnishes power feed for the work, leaving the operators hands free to guide the work

A power work feed, adaptable to precision sawing requirements, is now furnished with the "Doall" bandsaw made by the Continental Machine Specialties, 1301 Washington Ave., South, Minneapolis, Minn. Power for the feed is obtained from a spring motor built into the base of the machine. A constant pressure of 50 lb. is delivered. However, the feed pressure is controlled by a pedal to permit regulation of the cutting pressure, or for instantaneous release.

Another improvement is the device for inside and outside circle cutting.



Close-up of the table with built-in plate and pivot holes for cutting circles of any diameter

A plate set into the work table has a series of tapped holes to accommodate center pivots. The work is revolved on these centers, thus providing a fixed axis that automatically maintains the true circle being cut. The plate slides in the work table in order to provide an adjustable center, or pivoting point, at any desired distance from the saw.

A magnifying glass is now furnished for use on intricate and exacting work with precision narrow blade saws. The glass magnifies approximately 3 times, and is large enough in diameter to permit the operator to watch the cutting action with both eyes.

Black Hawk "Porto-Power" 20-Ton Unit

A hydraulic jack for heavy-duty work, the capacity being 20 tons, has been announced by the Black Hawk Manufacturing Co., Milwaukee, Wis. The jack is a unit of the "Porto-Power" line, (*AM*—Vol. 79, page 347) and consists of a pump and ram separated by a reinforced flexible hose. Because of the remote control feature, the ram operates at full capacity in any direction, making it adaptable for vertical lifting or downward pressing in a press frame. The pump may be mounted on a portable wheeled stand or may be carried directly to the job. Collapsed, the height is 10¼ in., the plunger travel is 4½ in., and a screw extension of 3¾ in. gives an over-all height of 18 in. The ram can be operated in crowded quarters, the over-all diameter of the unit being only 4 in.

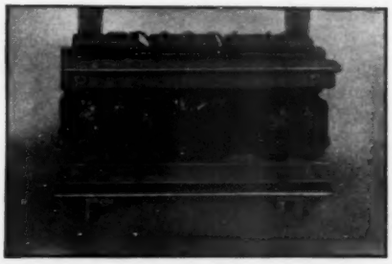
The unit is adaptable to general shop work. It can be used for pressing operations or a number of others by building up combinations of attachments.

Forbes & Myers Three-Phase Transformer

A three-phase transformer, designed to demonstrate machinery where only one voltage is available, has been developed by Forbes & Myers, 172 Union St., Worcester, Mass. Machinery may be arranged for any voltage, and the transformer will supply it from any usual commercial line. The transformer will serve machinery when a small plant moves to another building, making it unnecessary to rewind or exchange motors for a different voltage.

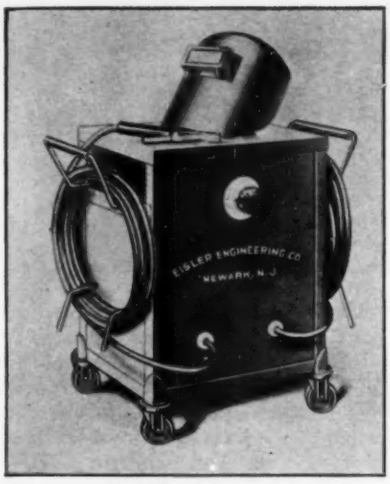
The transformer is semi-portable, and can be installed easily. It can be placed on the floor, bolted to the wall, or hung from the ceiling. The active parts are securely attached to steel angles, and the whole is covered by a ventilated steel case, not shown in the illustration. No oil is used for cooling.

Transformers are regularly equipped with terminals for 220, 440 and 550 volts, three-phase, 60 cycle. Two phase or other wiring can be supplied. The transformer will give either of the other voltages or both at the same time. It will change 220 to 440 and 550 volts, 440 to 220 and 550 volts, 550 to 220 and 440 volt, without any alteration in the transformer. Standard sizes are from 1 to 50 kva.



General" Pre-Formed Tool Bits

The Equipment Co., 11246 East Vernor Highway, Detroit, Mich., has the national distribution for the "General" pre-formed tool bits made by the General Tool Bit Corporation, Detroit. The tool bits are available in standard sizes, ground all over, including the ends. The ends are furnished with a compound angle and thus the time required by the operator to prepare one of these bits is low. The bits receive a series of heat-treatments and a series of grinds and are furnished in both high speed steel and in cobalt super high speed steel. The stock usually ground off before the bit is put into operation is saved by this method of producing these bits.

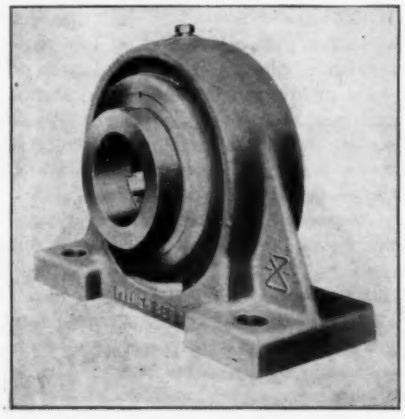


Eisler Arc Welders

Portable and stationary arc welding units have been announced by the Eisler Engineering Co. Inc., 749 South 13th St., Newark, N. J. Three sizes are supplied—40-200 amp., 50-300 amp., and 75-400 amp. in models having 11- and 21-point controls. The units take 1/16- to 5/32-, 3/32- to 1/4-, and 1/8- to 5/8-in. electrodes, respectively. Special air ducts built into the transformer assure natural ventilation. The temperature rise of the units is 31 C., and the time of recovery from the short circuit to 5 per cent of normal does not exceed 2 cycles of 60 cycles single-phase current.

Palmer-Bee Pillow Block

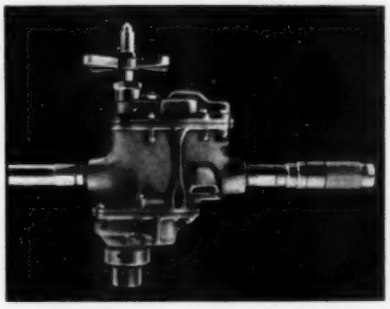
A self-aligning pillow block, which will withstand greater shock load than a shaft of corresponding diameter, has been placed on the market by the Palmer-Bee Co., Detroit, Mich. The bearing operates on a ball and socket principle as the housing is finished to a spherical surface and fit that permits a free oscillating movement of about 3 deg. maximum in any direction and at the same time maintains accurate alignment of the shafts without binding. The pillow block is mounted with a Hyatt heavy duty precision bearing in a machined housing which is made dust and dirt proof. This pollow block is available from stock in all standard shaft sizes, for all types of service.



"Rotor" Types E-72 and E-73 Air Drills

Low weight for the drilling capacity available is claimed for the Model E-72 and E-73 rotary type air drills announced by The Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland. The E-73 is rated at 300 r.p.m. and has a No. 3 Morse taper socket, for 1¼ in. drilling and 1 in. reaming, whereas the Model E-72 is rated at 450 r.p.m. and has a No. 2 Morse taper socket and is suitable for 3/4-in. drilling and 11/16-in. reaming. The weight of the machine is only 22 lb.

The multi-port, quick-acting governor responds instantly to changes of load pressure. The rotor type motor is of one piece construction and affords a tool that is well balanced and easy to assemble or disassemble.



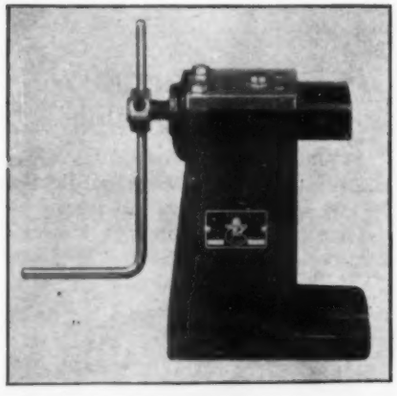
Langelier Bench-Type Multi-Spindle Drill

A bench-type multi-spindle machine used for drilling seven holes in the tops of plastic novelties has been developed by the Langelier Mfg. Co., Providence, R. I. This machine is also used for drilling vent holes in pistons installed in hydraulic shock absorbers. A feed lever that operates through a rack and gear segment is provided for this type of job as the material drilled is aluminum. In all, the company makes four different machines for drilling six holes with centers ranging from 3/4 to 1 1/16 in. pitch circle. Bench space occupied is 30 in. front by 11 in. deep and the over-all height is 9 in.

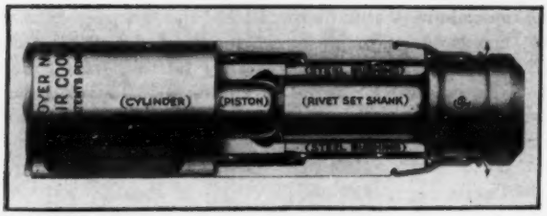
For the operation shown the parts are loaded into a V-locator and the slide is fed forward by the operator. After making the full drilling stroke the slide is returned to the starting position by a spring. Six of the holes are equally spaced on a circle ½ in. in diameter and the seventh hole is drilled in the center. The drills are 1/4 in. diameter, and the special construction of the drillhead makes this close center layout possible. The driving spindle is mounted on ball bearings, and the drilling spindles are of the crank type located on fixed centers.

Haskins No. 602 Vise Fixture

To meet the present requirements for accuracy in high-speed tapping and drilling, as well as such operations as countersinking and counterboring, the R. G. Haskins Co., 4630 West Fulton St., Chicago, has developed the No. 602 vise fixture. This is claimed to be simple to operate, easy to use and to be permanently accurate. The three-point contact jaws are made of hardened tool steel. Five combinations of jaws handling round stock from 1/8 to 1 in. in diameter are available. The handle can be adjusted to any position and it is necessary to move this handle only 30 deg. to release a part. The vise base is provided with a T-bolt and slot.



Langelier bench-type, multi-spindle drill for plastics and metal work



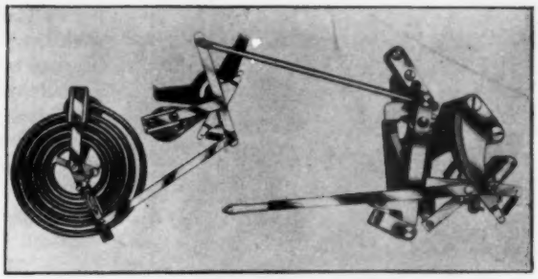
Boyer Air-Cooled Riveting Hammers

Air cooling through the use of exhaust air is now a feature of the Boyer riveting hammers made by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y. Four ports carry the cooling currents of exhaust air down the length of the cylinder to its nose end and out past the rivet set head. Where they parallel the rivet set shank, these ports are formed by the inner wall of the cylinder and the grooves in a wear-resistant steel bushing. These four ports are open where the nose end of the cylinder meets the base of the rivet set head.

Several advantages are gained by this construction: Rivet set breakage is reduced because the set retains its temper longer by operating at a lower temperature; a cooled rivet set permits more rivets to be driven before a change of sets is necessary; by cooling the nose end of the hammer excessive heat is eliminated and the operator can use the hammer more continuously; wear of the nose-end portion of the cylinder is overcome by the use of a removable hardened steel cylinder bushing; a higher degree of hardness on the internal nose end is possible; and the entire length of the cylinder is air-cooled, adding longer life to the hammer as a whole.

Signal Model OB-4 ¼-In. Portable Drill

An improved standard-duty, ¼-in. portable electric drill, known as the improved OB-4 model, is announced by the Signal Electric Mfg. Co., Menominee, Mich. The switch is in the handle which is ventilated. An Almond 3-jaw chuck with key and an 8-ft. rubber-covered cord and rubber plug are supplied.



Lyon 15-Ton Hydraulic Lift Truck

A 15-ton hydraulic hand lift truck, believed to be of the largest capacity of any such equipment ever built, was constructed by the Lyon Iron Works, Greene, N. Y., for a manufacturer making automobile stampings. It is used in transferring dies to and from large stamping presses.

A handle is provided for pulling by hand, and a hitch is provided for towing by a power truck. The elevating frame is raised by hydraulic rams operated by a hand pump. The carrying platform is 30x84 in. long and has a lowered height of 9¼ in. and elevates 3¾ in.

There are four wide-face rear wheels

and two front wheels, all with extra large ball bearings. Large thrust and radial bearings in the fifth wheel allow easy turning. Main frame and elevating frame are of heavy structural members, arc welded.

Pressure Compensator for Foxboro Meters

Errors due to variations in static pressure are corrected in the measurement of flows of compressible fluids such as steam, air and gas, by means of the automatic pressure compensator developed by the Foxboro Co., Foxboro, Mass. The device is merely a simple spiral pressure tube connected to a lever. As the line pressure changes, the spiral adjusts the multiplication of the linkage between the float and pen arm. This is not an additive correction but a percentage correction. The linear amount of correction differs at different points of the chart and is calibrated to fit the flow formula of the meter. The automatic pressure compensator will correct the position of the flow pen for a change in pressure as small as $\frac{1}{10}$ of 1 per cent.

"Armco" Stabilized Steel

The American Rolling Mill Co., Middletown, Ohio, is in full production on "Armco" stabilized steel in the form of cold-rolled sheets and strip. Stabilized steel is a uniform, deep-drawing and non-aging type with all stretcher strains permanently eliminated in the tempered condition. It retains indefinitely the properties of temper-rolled steel, making prefabrication treatments unnecessary. Unlike usual mild steels for deep-drawing purposes, the stabilized steel has no sharp yield point in the temper-rolled condition.

Alumaweld Flux

A flux to be used with "Alumaweld" solder has been placed on the market by Alumaweld Company of America, 2442 South Parkway, Chicago, Ill. With the solder and flux, cast or sheet aluminum can be soldered at low temperature. Sheet steel, brass, copper or other metals can be soldered to aluminum with Alumaweld and the bond will remain indefinitely as no electrolytic action is set up between the solder and the metal to which it is joined.

Alumaweld solder and flux are applied with an ordinary soldering iron or blow torch. The solder has a tensile strength of 12,000 lb. per sq. in. and the finished joint can be worked or machined. It takes a polish over which chromium or any other plating can be applied.

The Round Table

TOOLS FOR EVERY JOB

"Did you have a good trip, Ed? And did you see anything that we can use here in the shop?"

"Yes, Al, I had a fine time. And I saw a way of handling tools that might interest you if you weren't so 'sot' in your ways."

"I'm willing to listen anyway. What's new in the tool handling game?"

"This shop I mention keeps a set of tools for every job of any size. Say it's the No. 2 pump body for instance. They would have all the drills, reamers, taps, milling cutters and boring bars used on that job in a special box. There'd be a place for each tool so they couldn't damage each other."

"I've seen that plan used Ed. It has advantages—and some drawbacks."

"I'm surprised that you'd admit any advantages. What are the drawbacks?"

"The biggest one is the cost."

"But you have to have the tools anyhow, Al. It doesn't cost any more to keep them all in one box."

"You forget, Ed, the number of duplicate tools you'll need on some work."

"Such as what?"

"Well take the No. 2 pump body as you suggested. Practically every drill is the same as used on other pump bodies and on other work as well. This plan would multiply the number of drills of any given size by the number of jobs they were used on."

"Even so, drills don't cost much."

"True enough, Ed. But when you start to buy even a ½-in. drill for every job where we use that size, you'd find a sizeable bill staring you in the face."

"But you'd be sure of having the right drills ready whenever you had to do that job. There'd be no hunting for tools in the toolcrib or time lost in getting them. When the man gets the whole bunch of tools in one box it's a time saver."

"The only question is, Ed, does it save enough to warrant the cost."

"Would it cost any more after you once had all the tools you needed?"

"Certainly it would. You'd have to keep a larger investment in tools and have a lot of tools idle much of the time. When it came to reamers and taps you'd find they would run into a lot of money, and money tied up is money lost. Your next dividend would go glimmering if I put that plan in the shop now. I don't believe it would pay with our size shop and output."

Is it economical to segregate all the tools for a given job? Does the expense of duplication offset the savings in time?

DISCUSSION

A Step Down

Whether a demoted foreman is a liability, as Ed believes, depends mainly on the man, his racial characteristics and how tactful he is handled. We have found that the demoted foreman is generally a very undesirable liability. Sometimes, the situation will work out, but it is so uncertain that the big boss should study each case from a humane as well as a business standpoint. First, the management (Al) has made a mistake; he and the company pay while the unsatisfactory foreman is exercising authority, and they continue to pay after he is removed.

If the manager has any doubts of the abilities of the prospective foreman he should either drop the idea of putting the man on the job or keep open a way out by making the appointment (1) temporary, (2) acting foreman or (3) conditional. Avoid announcing that So and So is the new foreman of Dept. Q and then in a few weeks have to admit a mistake and that another man will be appointed. Such actions cause management to lose caste in the eyes of the employees and leave open wounds in the organization.

It is the honorable thing to play fair with the demoted foreman and let him look elsewhere for a job. If he doesn't find something more to his liking, he will return to his old machine job and feel that the management is trying to be fair with him.—*E. E. Gagnon.*

Good Samaritan

It seems like good business for Al to recondition his customers' flood-soaked pumps at cost.

If the work is done at actual cost,

Al's shop isn't going to lose a cent, but on the other hand will gain a lot of good will. This good will may be just enough to influence some customers in the purchase of Al's pumps in the future. Manufacturers shouldn't pass up any chances to build up good will among their customers, especially where in a case like this there is no outlay of cash.

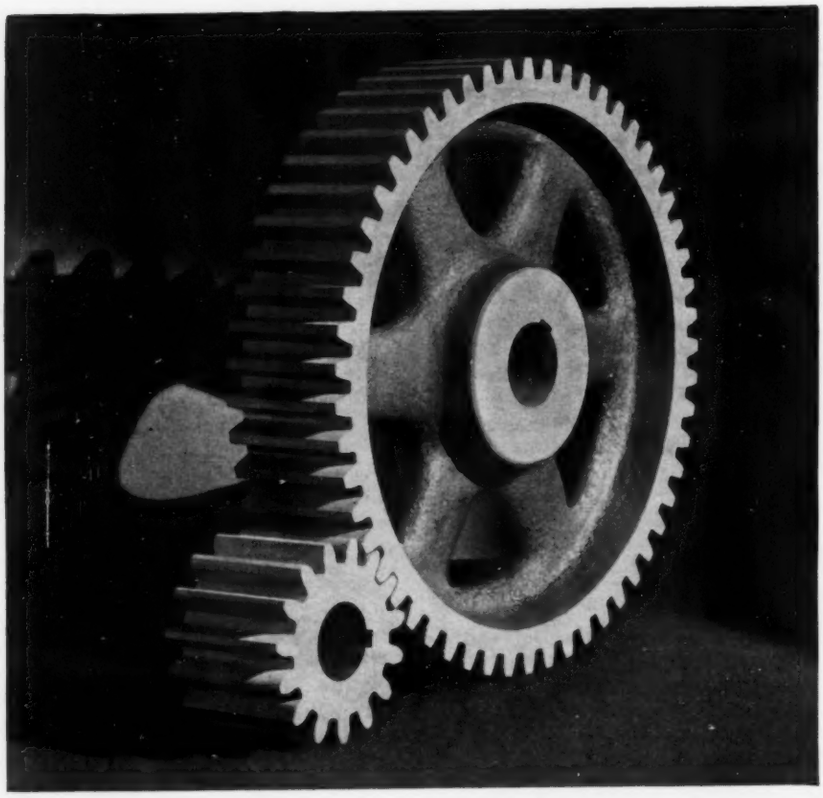
—HERBERT M. DARLING,
Superintendent, Wells Tool Company.

Home Talent

No small shop can afford to maintain specialists for all processes. As successful and uniform heat-treatment calls for expensive equipment in addition, Al is quite right in sending work outside. His statements regarding the losses due to inexpert handling are borne out by my own experience in a small shop. This shop produced, among other things, press tools in great variety, both as to shape and size and some of the dies were so intricate that their proper heat-treatment was a stiff problem. For years we persisted in attempting the work ourselves and the losses in hardening were terrific, judged by present-day standards. Added to this there was the loss in good will when a breakage caused us to default on our delivery date.

As there was no firm specializing in heat-treating, we had to seek an alternative. We approached three other firms in the same town engaged in similar but not competitive work, and suggested the setting up of a specialist plant for heat-treatment and forging on a co-operative basis. The pooled resources enabled the best of equipment and the highest of skill to be obtained and the results were highly successful. Indeed, so satisfactory were they that the principle was extended, and a joint servicing department was set up to cover essential maintenance services. The partners cooperated for certain specific purposes only and were financially responsible only in proportion to the value of the work done for them.

—ROY VERNON WADE,
Glasgow, Scotland



"Spurred" for the HARDEST TASKS

● From an ounce to 20,000 pounds . . . all Horsburgh & Scott gears, whether spur or any other kind in industrial use, are of the rugged "husky" type . . . built to endure. A half century of experience, unceasing vigilance in the selection of materials and painstaking care in design and manufacture, make Horsburgh & Scott gears the finest in the world. You'll find proof in their trial.

A helpful 448 page Gear Book awaits your request.

THE HORSBURGH & SCOTT CO.

GEARS AND SPEED REDUCERS

5112 HAMILTON AVENUE, CLEVELAND, OHIO U. S. A.

• The greatest source of heat-treating trouble in many plants is the practice of allowing anyone who can heat a piece of steel to attempt the heat-treating. Although present-day developments in heat-treating equipment have contributed much toward improving conditions, any attempt to eliminate the human equation is illogical. Heat-treating still remains an art, and it is the practical man skilled in that art that forms the span between success and failure.

For the shop having a considerable amount of diversified heat-treating it is desirable to hire a skilled man and to build modern heat-treating equipment around him. Those who do not find it justifiable to employ a skilled man should unhesitatingly send their work to a specialist. —PETER L. BUDWITZ.

New Tricks

It is the duty of every one in the shop, foreman included, to cooperate in getting out satisfactory work at a minimum cost. The difference between the foreman and his men is that they both work toward the common end in a different manner. The foreman works with animate tools; the men with inanimate. The foreman who oppresses any workman unnecessarily is comparable to the workman who would

deliberately destroy the cutting edge of a tool before advancing it to the cut, for the workmen are the foreman's tools.

Supervision is necessary and discipline must obtain, but tact and common sense must be their boon companions at all times.

The effect of old Jim Weston being deprived of the use of his chosen indicator and being forced to use a less efficient one does not end with the job on which he was working at the time. Jim will say to himself that the harder he tries to advance the interests of his employers, the less chance he has because of the self-conceited tyrant in charge. The next step is a what's-the-use attitude. Jim must unburden his hurt to somebody and soon the whole shop knows all about the episode. Two or three repetitions of such unreasonable bossing and the foreman will have the whole force in opposition to him; and opposition is none the less real because it is hidden.

—JOHN E. HYLER.

Al's objection to too much instruction by the foreman and his contention that a foreman's main job is to get out satisfactory work at a minimum cost are opinions held by many authorities.

The foreman's job is building up his department and organizing his men to produce the most and the best work, as well as breaking in new men, but when it comes to forbidding a workman, especially one who is a good mechanic, to use an instrument in which he has great faith and substituting one that is inferior, it is an insult to the man's intelligence and is bound to cause him to lose respect for the foreman.

On the other hand, the foreman should encourage his men to use their ingenuity to find the best methods of doing the work, and give them credit when credit is due, even though it may be at the expense of some of his pride.

—ROBERT KNOTEK,
Toolroom Foreman,
Cleveland Plant,
Fisher Body Corporation.

It seems to me that the foreman Al is talking about shows a lack of both intelligence and diplomacy, which render him unfit for his job.

Instruction is helpful only when the instructor knows from experience what he is talking about. While a lot can be learned about machine work from books and by watching the other fellow, there are many fine points about it that can be learned only through doing the actual job. That is one of the principal reasons why a foreman, to be successful in getting out the work and at the same time keep on the good side of his men, must be a man having thorough experience or else be intelligent and shrewd enough to know when the work is being done in the best possible way.

The old saying that two heads are better than one works out well as a rule because the majority of men in the shop are, or can be made, interested enough to submit their ideas on how to do the work. However, if the foreman is not diplomatic he can soon drown their enthusiasm.

—HARRY SWANSON.

When anyone hires a new machinist he should expect him to be able to do most routine work, or to set up work and to have enough ingenuity to handle almost any job in the shop. Any

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machinist who is not afraid of his job will ask for information as to the accuracy required or the handling of some special machine. So the foreman should not spend too much time in instructing the men unless they desire instruction.

The foreman is responsible for the progress of work through the shop and should be responsible for good feeling between the management and the men. With the changes in design and the general advancement of machines and methods, it is often necessary for the foreman to give general instructions. That is his duty and it will not cause friction and trouble among the men.

Some time ago I was talking to a railroad machinist. He tried to give me the idea that the railroad shops had been doing the same jobs so long that they had decided which method was the best, so that once the trade was learned, it was necessary only to sit back and wait for a pension. Since then that machinist has returned to the shop after being idle during the depression, and he found that he needs quite a lot of instruction as to accuracy and methods. He is now getting it from the foreman by request.

—F. F. Anderson.

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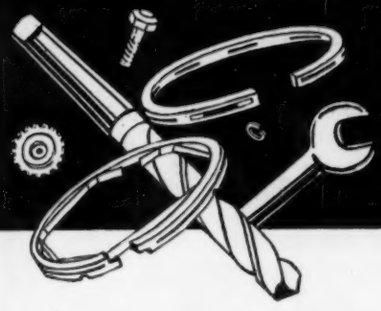

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It has always been the unwritten law that a person may quit a position when he pleases and secure another one when he can. Any deviation from this principle will not be of the least benefit to a hard-fisted, feudal-minded employer. As soon as it becomes known to the employees that they dare not resign to better their positions in other local shops, there will be a reaction more disturbing than the loss of a few employees to a more progressive manufacturer.

The policy that Bill Bowers attempts to revive is selfish, in that it leaves him free to go after orders with all the cunning and shady tricks of the trade to beat his competitors, and then under a code of false ethics to whine, "Thou shalt not take my employees." Under the Bowers' plan, and with plants running now and then (mostly then), a workman would be compelled to stay with his employer as long as there was any work to be done, even if the end were in sight, and to pass up an opportunity to secure a steady position in another local shop.

Interchange of ideas spells progress, and ideas are in men; hence to be progressive it is advisable to allow men to change freely. —W. E. Fischer.

In my opinion Al's policy is one that will eventually lead to warfare. It is his action and the actions of others that are at the bottom of countless numbers of strikes today. Wage cutting and wage raising are equally dangerous. On the surface it would appear that Al's remarks about the worker getting all he can and what he is worth are sound. But on analysis there are several fallacies in his reasoning. He refers to skilled workmen. No skilled workmen are today without their union and its powerful organization to see that a standard rate of pay is maintained. The skilled workers are not being cheated.

Wages once set should be maintained. Of course, I've nothing against wage increases when they are deserved. But this out and out buying a man by one concern from another is bad business and engenders too much resentment and hard feeling. When someone starts buying men from the previous buyer; what then? Does it just go on and on? No, such a chaotic state of affairs cannot or will not exist, and Al's policy is not only cutting the throats of others, but his own as well.

—Will Herman,
Superintendent, Tanenbaum Oil Company.